



# **Drones for Disaster Mitigation**

Aditya Shenoy – 161080036

Rahul Bhoir – 161080063

Kalyani Borkar – 171081990

Rani Deore – 171081993

Under the guidance of Dr. V. B. Nikam

# Content

- Introduction
- Problem Statement
- Objective
- Challenges
- Feasibility Analysis
- Proposed Framework
- Literature Survey
- System Requirements

# Introduction

- As use of drones rapidly expands, it is aided by improvements in technology such as high-speed cameras, sensors, and processors able to analyze the data rapidly and efficiently on the drone.
- Drones can either be controlled manually by an operator or fly autonomously, but as the use for an operator increases the cost considerably, it is clearly preferable for them to operate autonomously.
- A true unmanned aerial vehicle, UAV, is preprogrammed prior to flight to do a specific set of tasks on a specific flight path.

- In disaster mitigation, accurate infrastructure damage scaling is an issue
- Currently, there is no systematic planning of rescue operations
- Scarcity of available rescue equipment and skilled personnel
- Less automated life detection framework available

# Problem Statement

The proposed system should be able to capture images/videos of disaster affected areas using autonomously path planned drone, that can be further processed for infrastructure damage detection which is one of the crucial components of disaster mitigation involving path planning, detection of life using fine microphone and thermal sensor which will be efficient in rescuing more lives.

Objective



- Autonomous path planning of drones
- Image, video, and sensor data capturing using drone camera
- Life detection using captured data
- Infrastructure damage scaling using 3D modelling by photogrammetry
- Rescue path planning for the rescue team

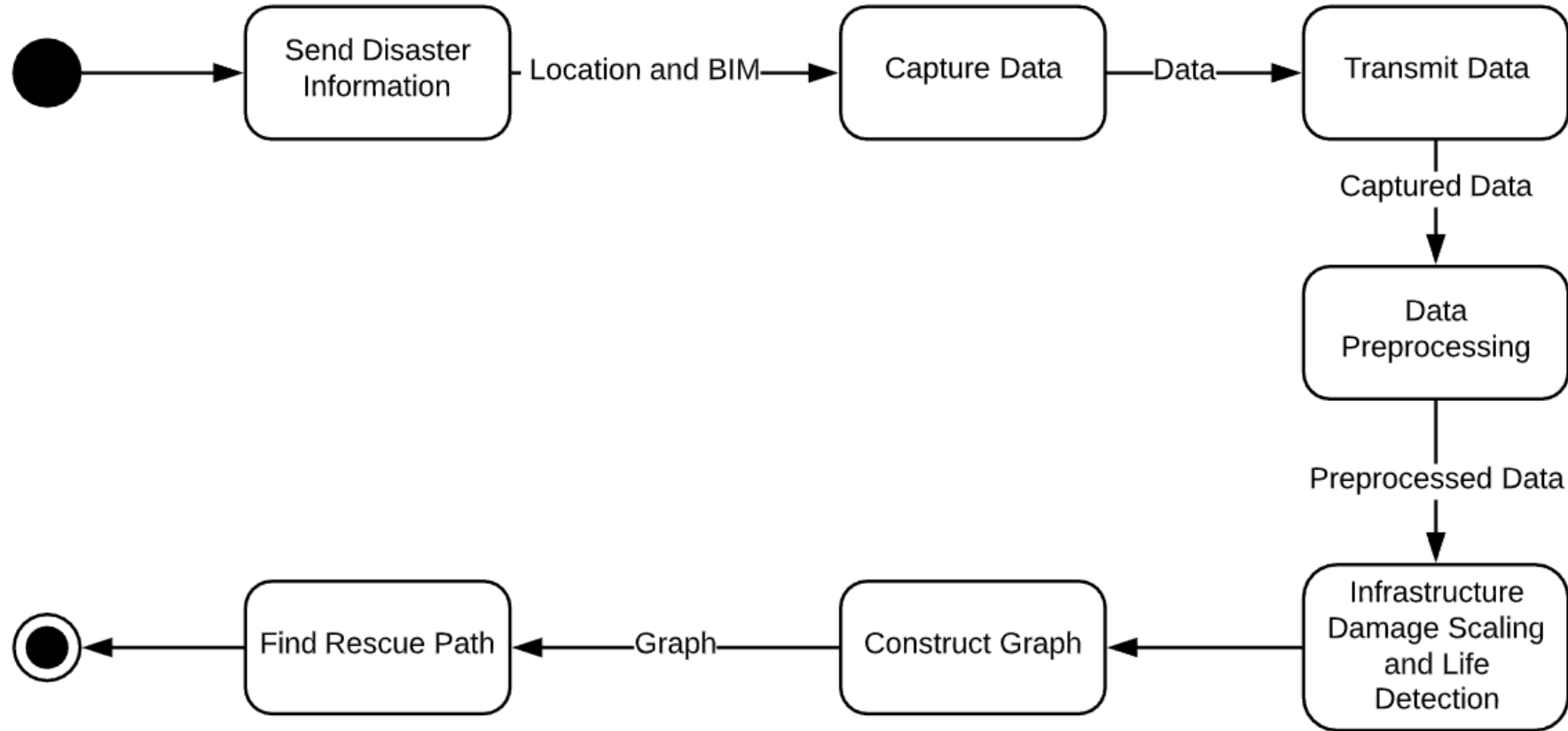
# Challenges

- Drone path planning should also consider periodic recharging of drones
- Initial drone calibration to avoid flight in wrong direction
- Life detection through thick walls and debris
- Loss of network signals if towers get damaged due to disaster
- Computational complexity for planning of rescue path

# Feasibility Analysis

- Cost of drones, cameras, and sensors is high
- The sensors and cameras that we have studied are appropriate for collecting the data required by our project
- This project would be useful in disaster prone areas
- Drones need regular maintenance
- Network strength needs to be maintained

# Proposed Framework



- Calculate the path of the drone and feed it for autonomous flight
- Capture image/videos and sensor data
- Transmit the data to the server
- Preprocess the data and apply trained machine learning model on it to classify infrastructure damage scale and life detection
- Construct a graph and find path for rescue mission



# Literature Survey

Sr. No.	Paper Title	Summary
1	Evaluation of Disaster Response System Using Agent-Based Model With Geospatial and Medical Details	Agent based modelling describing the cooperation of overall process in disaster response for transporting patients to definitive care
2	An Integrated Traveling Salesman and Coverage Path Planning Problem for Unmanned Aircraft Systems	Optimal path planning for UAVs to cover multiple regions by integrating TSP and CPP
3	Through Wall Human Detection Under Small Samples Based on Deep Learning Algorithm	Effective detection of human targets behind walls using deep learning algorithm
4	Design and Deployment of UAV-Aided Post-Disaster Emergency Network	Ad-hoc network of mobiles and UAVs where towers are damaged for post-disaster management

Sr. No.	Paper Title	Summary
5	Distributed Reinforcement Learning in Emergency Response Simulation	Use of reinforcement learning to plan rescue plans based on previous rescue plans
6	Through-Wall Detection of the Moving Paths and Vital Signs of Human Beings	Detection of human activities through wall using ultra wide band radar
7	Multimedia for Disaster Information Management	Analyzing social media, emergency management responders, etc data before, during and after disaster
8	Help from the Sky: Leveraging UAVs fir Disaster Management	Network assisted UAVs for disaster prediction, assessment, and response and limitations of drones
9	Audio-Based Search and Rescue With a Drone	Estimating the direction of sound source given audio measurements from an array of microphones

# System Requirements

- Drone
- 4k60 HDR Camera
- RF Sensor
- IR Sensor
- Fine Microphone
- TensorFlow
- Python

Thank You