

VISVESVARAYA TECHNOLOGICAL UNIVERSITY
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Video Based Disaster Site Surveillance System using an Unmanned Aerial Vehicle

A project report submitted in partial fulfillment for the requirement in
the degree of

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Abstract

In this project we present the implementation of a Disaster site surveillance system using an Unmanned Aerial Vehicle (UAV). Initially we present the design details of UAV chassis and control system of the UAV. Quadrotor UAVs are being increasingly deployed in military warcraft and off late, they have also found varied applications in the field of law enforcement, traffic analysis, swarm intelligence and mainly in various rescue operations. UAVs require sophisticated control system which are very challenging to build. Our focus is on the electronic control of the UAV. We propose a control system consisting of two stages - the Inertial Measurement Unit (IMU) and the UAV Flight Control. We demonstrate image transmission from UAV to the base station.

We use a low cost realization of IMU by fusing the output of MEMS sensors (accelerometer and gyroscope) using the Kalman Filter. The Kalman Filter takes input from both the accelerometer and gyroscope and returns an accurate estimate of the position of the UAV. In flight control part, we achieve the flight of the UAV by controlling the speed of each of the four motors. A possible implementation of the motor driver and speed control with PWM signals is shown. We implement the Proportional Integral Derivative (PID) controller to obtain error parameters for yaw, roll and pitch. These error parameters are then used to generate appropriate PWM signal for each of the four motors. We then present the tuning of PID controller for this application. We calculate the 3D co-ordinates of UAV taking raw values from sensors (Pressure sensor and GPS receiver). These global 3D co-ordinates resemble the position of UAV above Earth's surface used for tracking UAV.

We mount a serial camera on the UAV and transmit images to the base station. The images from the UAV can then be used for surveillance and to guide rescue operations in flood affected areas.