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A Novel Approach towards Design and Implementation of a Semi-Autonomous Drone for Rescue from Bees

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***Abstract*—The goal of this paper is to design a semi-autonomous drone capable of self-sustained flight via wireless communication and use its flight simulation to evacuate the harmful bees near our surroundings using the most economic means available. In this paper we highlight the development of drone and the sprayer model and also discuss the integration of sprayer model to the drone system. The sprayer model is mounted on top of the drone and the drone is operated by manual flight plans. The sprayer model is manually triggered by the motor. This model is used to spray the chemicals on the bee hives in the areas that cannot be easily accessible by humans.**

***Index Terms*— Sprayer Model, Drone, Thrust, Bee Hives, KK 2.2 Board.**

I. INTRODUCTION

The Main motto of this paper is overcome the problems faced by civilians due to formation of beehives in urban locality such as residential areas, office buildings, shopping malls, public crowded places etcetera by using drone technology.
The problems faced due to formation of beehives

- The most obvious downside problem is the threat of bee stings to the greater population.(figure2)
- Allergy to bees sting can cause serious fatal problems such as swelling of lips,diarrhea, difficulty in breathing etcetera
- Formation of bee hives in work locations lead to delay in work.
- Fear of bee stings can sometimes result in people developing a fear of is known as apiphobia
- Extreme reaction to bee stings can include anaphylaxis,which is a state of shock

II. EXISTING SYSTEM

The Existing technology to get rid of Beehives requires manual labor (professional bee removers). The entire process includes the following steps

- Wear light-colored and smooth-textured clothing. Bees are aggravated by dark-colors and rough clothing.
- Locate the bee hive.
- Ensure safety measures to go near the beehive

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- Use smoke or chemical to evacuate the bees

Figure 1

Figure 2

Figure 3

III. Proposed System

In the proposed system, instead of typical ways of evacuating bees using manual labor, we propose a new system where we use drone technology and use its flight simulation to evacuate the harmful bees near our surroundings. This proposed system helps to reduce the risk factor of manually evacuating the bees by up to 80%.

The proposed system consists of 2 modules:

- Drone(quad copter)
- Sprayer module

A. Quad-Copter Working Principle:

The quad copter is a simple design with four rotor propellers (figure 4). Two propellers rotate in clockwise direction and two propellers rotate in anticlockwise direction. The flight controller is the main part of the vehicle. The KK2 board controls all the operations commanded by us (figure 5).The four rotors create differential thrust and the quad copter hover and move accordance with the speed of the those rotors[1].Total mass of the quad copter including payload is 1kg.In order for the quad copter to overcome gravity and take off ,the total thrust produced by the rotors should be equivalent to twice the total weight to lift(figure 7).Therefore the total thrust produced by rotors should be 2kg.A quad copter has 4 rotors so the thrust produced by each rotor should be equal to 500g.

Total weight of the Drone:

- Payload Weight = 350g
- Weight of the drone :
  - Motors and ESC = 200g
  - Frame = 150g
  - Li PO battery = 150g
  - KK Board = 15g

- Receiver = 15g

- Total Weight including payload= 950 g

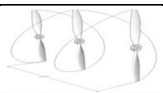
B. KV Rating to RPM Conversion:

- The KV Rating/value of a motor relates to how fast it will rotate of a given voltage.
- If the particular KV rating of a motor is 'A' KV, then the RPM generated by the motor is given by :

Motor RPM=0.8 x 3.5V x series cell count x 'A'kv

Where 3.5V = Nominal voltage of each cell in a battery
Series cell count=Number of cells connected in Series
The RPM will generate the required thrust.

Components Used:

COMPONENT NAME	SPECIFICATIONS	FIGURE
FRAME	Length:21.5cm Weight: 47g Quantity: 4pcs	
MOTOR	Model : D2822 Volts : 7.42 to 11.1v Max thrust : 660grams KV rating : 1800kv Motor size : 28 x 22mm	
ELECTRONIC SPEED CONTROLLER	Current: 30A	
BATTERY	Battery Voltage: 11.1V Capacity: 4200 mAh	
RADIO CONTROLLER	Channels : 6 Model : FS-CT6B Bandwidth : 500Khz RF Range : 2.405-2.475GHz Band : 140 Size :189 x 97 x 295 mm	
PROPELLER	Diameter: 45cm	
KK 2.2 BOARD	Atmega644PA	

Sprayer Module: Sprayer module (Figure 6) has 2 sections, they are
1.Chemical sprayer,
2.Spray controller with motor.
The chemical sprayer consists of chemical to be used to evacuate the bees. The motor is used to control the actuator of sprayer module. The motor is connected to KK board. On application of signal, the motor is turned on and the blades start to rotate, applying pressure on the nozzle of the chemical sprayer.

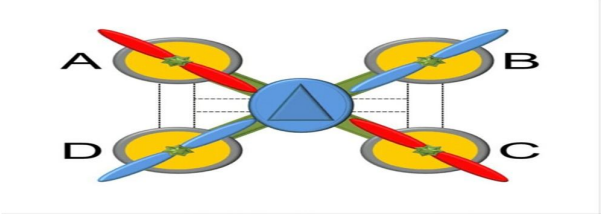


Figure 4: Quad copter Outline

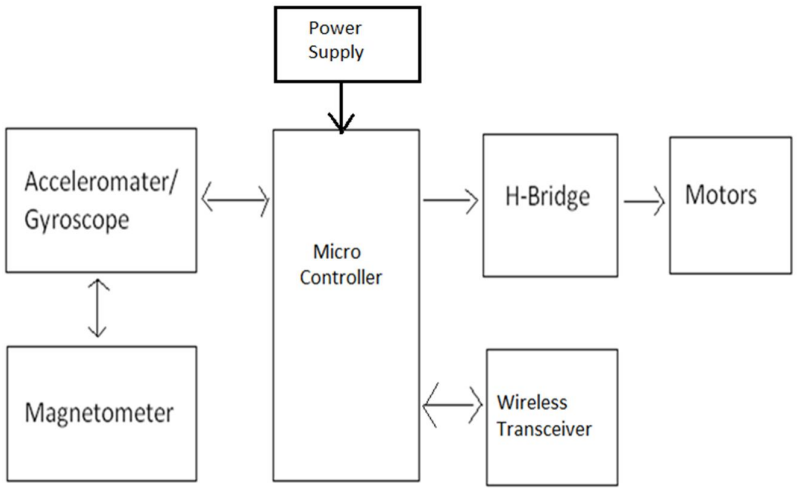


Figure 5: Block Diagram

Figure 6: Sprayer module

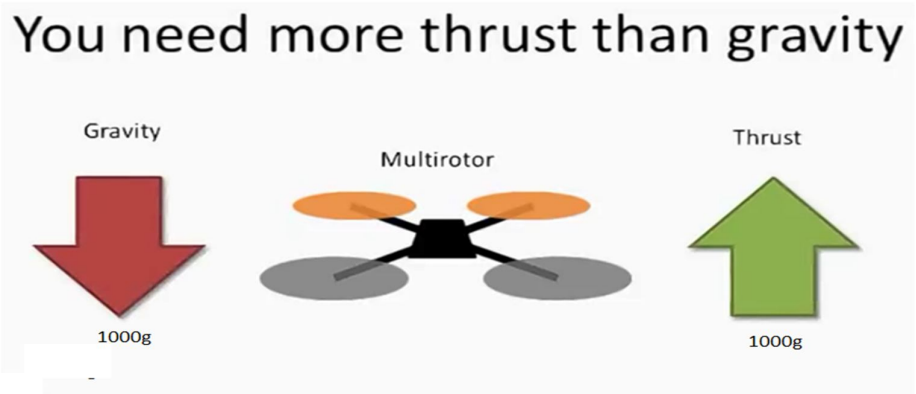


Figure 7: Thrust Principle

IV. CONCLUSION:

The designed prototype system is implemented and analysed at different stages. This proposed system will help the society with reduced risk factor from harmful bees. It introduces new technology for the professional bee keepers by reducing human work labour and providing safer methods to evacuate the bees.

Figure 8: Drone Model

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