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Application of Drone in Fire Detection & Spraying Pesticides

S Karthik Prakash, Amin Pradvith, Aishwarya S. B., Vinayambika S Bhat
Electronics & Communication Engineering
Mangalore Institute of Technology & Engineering
Moodabidri, India

Abstract:- as we consider present days, we have many developments in agriculture for increasing the production of crop. As we see an example of a developing countries like India. Here 73% of rural people believe and depends on the agricultures. Due to forest fire issues and diseases caused by insects and pests in fields, they have faced heavy loss and it also reduces the crops productivity. In order to enhance the crop quality chemical fertilizers and pesticides are used to kill the pests and insects. Manually spraying the pesticides and fertilizers to the crop will cause illness. As per the research of World Health Organization (WHO) about a million of people are ill affected. To overcome this problem the Unmanned Aerial Vehicle (UAV) aircrafts can be used to detect the fire at the early stage and to spray the chemical pesticides and fertilizers in order to avoid the health issues for people who are involved in spraying manually. As an application of agriculture, smart farming is been considered, which includes the use and application of UAV drone. The agriculture UAV drone used to expand the all areas of field which the drone will be able to cover it and the drones are highly capable, and also includes fertilizer and pesticides spraying, seed sowing, mapping etc. As per the market for agriculture UAV drones are expected to grow continuously by relating the technologies.

Keywords:- *UAV, Flame Detector Sensor, Artificial Intelligence, Smart Farming, IoT.*

I. INTRODUCTION

We know that majority of the crops which yield good quality of food are dependent on the rain with around 55% of the land not which is not irrigated, that is around 45% of the land being irrigated. However, the total population in our country is dependent on the former who are dependent on rain for a good yield of the cops for their forming [1]. Due to various changes in climatic conditions, terrible labour shortage and more labour cost, crops tend to loss due to pest, poor availability of agricultural funds and inputs, input wastage, poor support price structures all of these are the problems which causes the limit to access for proper quality of food for the living. Agricultural drone might be used for spraying pesticides, and can be used seeding and it helps prevent the crops from birds. Agricultural drone can also determine the temperature of the surrounding environment [2]. To solve all the above-mentioned problems, we here propose a project to design and implement a multipurpose drone. The various factors are been driven by market such as growth in agriculture sector, farm mechanism and government initiatives. Also, the increase on productivity in agriculture sector resulted in an increased use of crop sprayers. Now, the farmers are moving from traditional technologies to new way of farming.

The modernization in agriculture increases the productivity also the capital income. By adopting new modern technology, farmers intend to use mechanization equipment. A drone that is compact and thus less costly and more effective [3, 4]. This multipurpose drone can also be used in agriculture for spraying pesticides and fertilizers as well as for sanitization of streets, corridors and open areas. Implementing and making it multipurpose makes it even more worth to buy as it fulfils more than one purpose. Incorporating the latest information and development, the majority of the problem in forests is the forest fire. They cause the disturbance to the entire flora and fauna causing imbalance in the ecology and in bio-diversity and also in region environment. The main causes and reasons for forest fires occurs naturally, they are lightning, low humidity and high atmospheric temperatures. Fire can also be caused by human interaction such as cigarette and bide, naked flame or any contact with electric spark [5].

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Table 1: Literature review on disaster management and precision agriculture applications:

Study	**Year**	**Application used**	**Method**	**Drone model used**	**Future insights**
Rahul Desale *et.al* [1]	2022	Pre disaster management	Use heterogeneous UAV networks made up of fixed wing	PRO: Search and rescue missions.	Inspection tasks are performed by the usage of unmanned aerial swarms.
Rakesh Katuri *et.al* [2]	2021	Disaster response and recovery	Enhance WSN data collecting	Aerones	Direct UAVs to specified places and reduce data forwarding
B.D Deore *et.al* [3]	2020	Mapping locations, Airlifting victims	On-board processing module	Quad copter drones	There is a greater emphasis on precision in navigation; Lack of real-world verification.
B. Suraj *et.al* [4]	2020	Crop monitoring	Development of frame work	Lancaster 5	The flying time of a drone is mostly determined by its battery capacity.
M.A. Khan *et.al* [5]	2020	Precision agriculture	Extract information on biomass levels	Santera PHX AnEagle RX-60	Designing a decision support system (DSS)
S. Eskandari *et.al* [6]	2019	Irrigation management	Case Study	HoneyComb eBee SQ	Improving model predictions at larger scales aims to address information gaps
D. Long *et.al* [7]	2019	Artificial pollination	Research Model	Quad copter drone	AI algorithms are being developed, such as the heredity algorithm (HA).
Zhang J *et.al* [9]	2018	Biological control	Case Study	Agbot Quad copter drone	An increased demand for multidisciplinary research among agronomists, ecologists
Franesco Marinello *et.al* [10]	2018	Disaster assessment	Review Paper	Auxdrone Zipline	There is a greater emphasis on precision in navigation

Table 1

Industry	Drone application
Infrastructure	Investment monitoring, asset inventory
Agriculture	Analysis of soils and drainage, Crop health monitoring
Transport	Delivery of goods, Medical Logistic
Security	Monitoring lines and sites, Proactive response
Insurance	Support in claims settlement process, Fraud detection
Telecommunication	Tower maintenance, Signal broadcasting
Mining	Planning, Exploration, Environmental impact assessment

Table 2: Utilization of drone in different sectors

II. PAPERWORKS

Agriculture is the huge sector in India. It is facing a lot of problems these days due to no proper usage of modern techniques [8]. Other problems include chemical contact with pesticides which is harmful and danger from animals and insects. The drone designed here can be used for spraying pesticides and crop protection. This is done by the pilot standing at a safe distance controlling the drone (UAV). This provides safety and helps the person in reducing the time taken for spraying pesticide [9]. Thrust is the main principle on which the drone system works. This multipurpose drone can also be used in agriculture for spraying pesticides and fertilizers as well as for sanitization of streets, corridors and open areas. Implementing and making it multipurpose makes it even more worth to buy as it fulfils more than one purpose [10].

UAV are mostly used for multiple purposes nowadays. Agricultural drone can also determine the temperature of the surrounding environment. The various factors are been driven by market such as growth in agriculture sector, farm mechanism and government initiatives [11, 12]. Also, the increase on productivity in agriculture sector resulted in an increased use of crop sprayers. Now, the farmers are moving from traditional technologies to new way of farming. The modernization in agriculture increases the productivity also the capital income. By adopting new modern technology, farmers intend to use mechanization equipment. A drone that is compact and thus less costly and more effective [13].

The drone designed in such a way that it is attached to a pump. Pump will be used for intake fluid and produce it to the tank, and from tank the fluid will pass through valve to nozzle spray. By which the fluid is sprayed all through the field and the drone can be controlled and navigated by the hand controller and located [14]. The use of pesticides in agriculture is very important to agriculture and it will be so easy if will use intelligent machines such as robots using new technologies. The first step represents the fixed-wing roll of a DRONE. For a wide-angle view the drone should fly at an altitude from 360m to 5400 m. If fire was detected, the drone starts to fly at low altitude at the affected area. This is the second stage [15, 16]. At the third stage drone has to confirm whether there is fire or not. If the fire is detected at suspected area. Where it is done by flying rotary wing drone at ground level to confirm there is fire or not.

III. RESEARCH AND METHODOLOGY

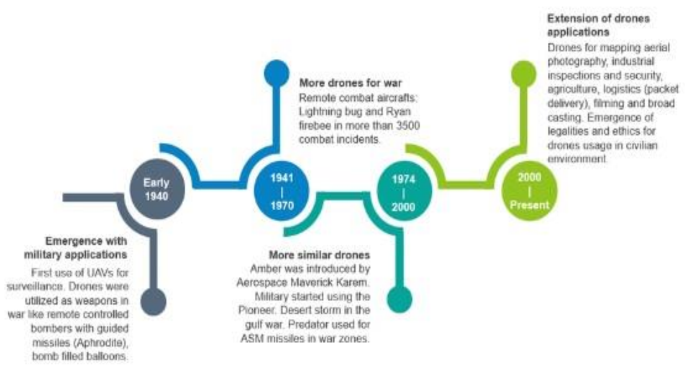

Fig. 1: Evolution of drone technology [10]

Figure 1 depicts the evolution of the drone technology since 1940. In earlier times drones were like computers, big expensive and virtually impossible for the average consumer to imagine owning or operating. Fortunately drone tech has come a long way since then. Today, drones are available in models ranging from massive enterprise level machines meant to enhance farming and construction operation to small fun consumer models designed for racing and photography [16]. The first unmanned winged aircraft was called the rust and proctor aerial target based on designs by a world-famous engineer Nikola Tesla. The rust and proctor aerial target was controlled via radio signals. Current drone stats from expanding ramblings experts project that there will be million drones by 2020 with an estimated 3.5 million small drones in use by 2021, eight percent of the population own drones. The agricultural drone market is currently valued at 1.2 billion dollars and will rise to 4.8 billion dollars by 2024 [17].

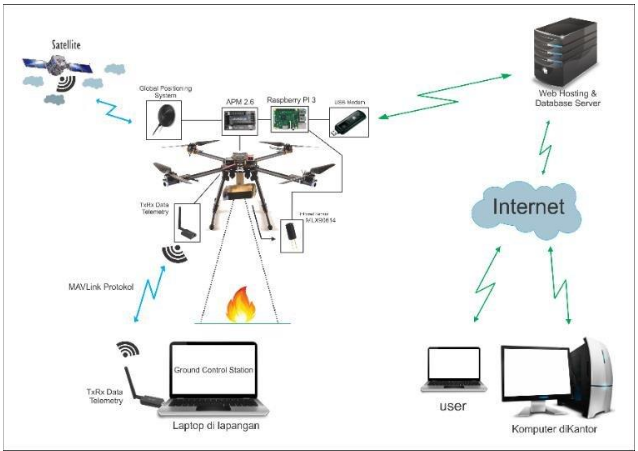

Fig. 2: Analysis of real time forest fire monitoring system [25]

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Figure 2 propose a solution for forest fire prevention technology allows constant monitoring of forest areas searching for variations in temperature of fire attempts. Information is gathered and monitored and report thermal geo referenced informations related to our area of interest, this information generates instructions to the software platform built specially to command the fleet of drones to strategically define the areas roots and timing of flights [18, 19]. The mentioned algorithm uses light and movement tracks and image processing methods based on histogram which is classified based on histogram as well as optical flow method for fire pixel detection. First, histogram classification of thermal material such as fire-resistant circuits and extract them. They are also analyzed to distinguish flames from other models [20]. By performing special operations like morphological and blob calculation method, fire or flame can be traced at the end of each infrared image.

Drones are equipped with flame sensors. The detection for fire can be analyzed. Images captured by IR cameras will be produced NDVI (normalized difference vegetation index) which used to generate the NDVI maps of the terrain. NDVI graphical map indicates the fire damage assessments [1-5]. The signal sent from the drone is transmitted to the ground station through transmitter and received through the receiver and alarm system goes on [21, 22].

Fig. 3: Pesticide spraying drone [3]

Figure 3 shows the development and evaluation of Drone mounted sprayer for Pesticides Applications to crops. They developed a low-volume sprayer combined with UAV helicopters [23, 24]. This helicopter has a maximum payload weight of 30 kg and 4 m of rotor diameter. This needed at least gas of one gallon for every 40 minutes. This study has the way for the development of air-powered drone systems for plant production at a high target rate and the size of large VMD droplets [25].

IV. CONCLUSION

The Unmanned Ariel Vehicle aircraft is used to detect the fire at the early stage in the forests so that major losses can be avoided and to spray the pesticides and fertilizers on the agriculture fields in order to avoid the health issues caused by the chemicals to the people who are involved in spraying manually. The designed drone reduces the manual work and is time efficient. This will also reduce the labor cost.

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