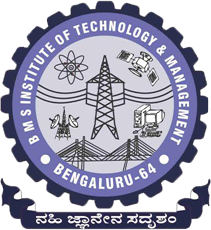
BMS INSTITUTE OF TECHNOLOGY & MANAGEMENT

YELAHANKA, BENGALURU - 560064



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**PROJECT BASED LEARNING**

2020-21 Odd Semesters

Synopsis of Application Development Using Python- 18CS55project work

Synopsis of Computer Networks And Security- 18CS52project work

***“*AGRICULTURAL DRONE”**

*Submitted By*

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*Under the guidance of*

|  |  |  |
| --- | --- | --- |
| Mrs. Vidya R Pai  Assistant Professor |  | Mrs. Bharathi R  Associate Professor |

2020-2021

**INSTITUTE VISION**

To emerge as one of the finest technical institutions of higher learning, to develop engineering professionals who are technically competent, ethical and environment friendly for betterment of the society.

**INSTITUTE MISSION**

Accomplish stimulating learning environment through high quality academic instruction, innovation and industry-institute interface.

**DEPARTMENT VISION**

To develop technical professionals acquainted with recent trends and technologies of computer science to serve as valuable resource for the nation/society.

**DEPARTMENT MISSION**

Facilitating and exposing the students to various learning opportunities through dedicated academic teaching, guidance and monitoring.

**PROGRAM EDUCATIONAL OBJECTIVES**

1. Lead a successful career by designing, analyzing and solving various problems in the field of Computer Science & Engineering.
2. Pursue higher studies for enduring edification.
3. Exhibit professional and team building attitude along with effective communication.
4. Identify and provide solutions for sustainable environmental development.

|  |  |
| --- | --- |
| **Computer Networks and Security–18CS52- Course Outcomes (COs) w.r.t this PBL** | |
| CO 2 | CO DEFINED |
|  | Classify routers, IP and Routing Algorithms in network layer |

|  |  |
| --- | --- |
| **Application Development Using Python–18CS55- Course Outcomes (COs) w.r.t this PBL** | |
| CO 4 | CO DEFINED |
|  | Interpret the concepts of Object-Oriented Programming as used in Python |

**Project to Program Outcomes (PO) Mapping**

**Project Name:** AGRICULTURAL DRONE

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **COURSE** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| Computer networks and security | ✓ | ✓ | ✓ | ✓ | ✓ |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |
| Application Development Using Python | ✓ | ✓ | ✓ | ✓ | ✓ |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |

|  |  |
| --- | --- |
| **Program outcomes (POs):** | |
| **PO1** | **Engineering knowledge:** Apply the knowledge of Mathematics, Science, Engineering fundamentals and an engineering specialization to the solution of complex engineering problems |
| **PO2** | **Problem analysis:** Identify, formulate, review research literature, and analyse complex Engineering problems reaching substantiated conclusions using first principles of mathematics, Natural sciences and engineering sciences |
| **PO3** | **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations. |
| **PO4** | **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the Information to provide valid conclusions |
| **PO5** | **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern Engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations. |
| **PO6** | **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice. |
| **PO7** | **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for Sustainable development |
| **PO8** | **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. |
| **PO9** | **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings |
| **PO10** | **Communication:** Communicate effectively on complex engineering activities with the engineering Community and with society at large, such as, being able to comprehend and write effective reports And design documentation, make effective presentations, and give and receive clear instructions. |
| **PO11** | **Project management and finance:** Demonstrate knowledge and understanding of the Engineering and management principles and apply these to one’s own work, as a member and Leader in a team, to manage projects and in multidisciplinary environments. |
| **PO12** | **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. |

**Project to Program Specific Outcomes (PSO) Mapping**

**Project Name:** AGRICULTURAL DRONE

|  |  |  |
| --- | --- | --- |
| **COURSE** | **PSO1** | **PSO2** |
| Computer Networks And Security | ✓ | ✓ |
| Application Development Using Python | ✓ | ✓ |

|  |  |
| --- | --- |
| **Program Specific Outcomes (PSOs):** | |
| **PSO1** | Analyze the problem and identify computing requirements appropriate to its solution. |
| **PSO2** | Apply design and development principles in the construction of software systems of varying complexity. |

**Abstract:** While aiming to produce enough food and remain sustainable, agriculture is facing significant changes. In the new agricultural era, farmers are able to **use various high-tech sensing devices based on GPS, variable rate application, steering systems and remote sensing, as well as**[**farm management software**](http://bit.ly/2GCG7t9). The introduction and the use of modern and [precise farm technologies](https://blog.agrivi.com/en/post/technology-essential-for-precision-farming) brings revolutionary changes into farming. In other words, modern farm technology revolutionizes **the way in which farmers work.** By using precise technology, farmers are able to **optimize both farm productivity and profitability based on real-time field information thus protecting the environment**, which can be a turning point to success.

An **agricultural drone** is an [unmanned aerial vehicle](https://en.wikipedia.org/wiki/Unmanned_aerial_vehicle) used to help optimize [agriculture](https://en.wikipedia.org/wiki/Agriculture) operations, increase [crop production](https://en.wikipedia.org/wiki/Crop_production), and monitor crop growth. [Sensors](https://en.wikipedia.org/wiki/Sensor) and [digital imaging](https://en.wikipedia.org/wiki/Digital_imaging) capabilities can give farmers a richer picture of their fields. Using an agriculture drone and gathering information from it may prove useful in improving [crop yields](https://en.wikipedia.org/wiki/Crop_yield) and farm efficiency.

Agricultural drones let farmers see their fields from the sky. This [bird's-eye view](https://en.wikipedia.org/wiki/Bird%27s-eye_view) can reveal many issues such as [irrigation](https://en.wikipedia.org/wiki/Irrigation) problems, soil variation, and [pest](https://en.wikipedia.org/wiki/Pest_(agriculture)) and [fungal](https://en.wikipedia.org/wiki/Fungal) infestations. [Multispectral images](https://en.wikipedia.org/wiki/Multispectral_image) show a [near-infrared](https://en.wikipedia.org/wiki/Near-infrared) view as well as a visual spectrum view. The combination shows the farmer the differences between healthy and unhealthy plants, a difference not always clearly visible to the naked eye. Thus, these views can assist in assessing crop growth and production.

Additionally, the drone can survey the crops for the farmer periodically to their liking. Weekly, daily, or even hourly, pictures can show the changes in the crops over time, thus showing possible “trouble spots”. Having identified these trouble spots, the farmer can attempt to improve crop management and production.

**Introduction:-** Unmanned aerial vehicles (UAV), commonly named drones, are small aerial platforms weighing up to 20 kg (50 lbs.). Due to their size, they **cannot be boarded by a human body**(yet). Drones can be operated in two ways; **directly,**in which a human has complete control of the vehicle by wireless remote; and **autonomously,** in which the vehicle is able to control itself and follow a route based on the data from GPS or other sensors.

Ensuring the health of the rural economy has been one of the world’s most challenging issues. In the more developed countries, the Internet of things (IoT) has been employed to benefit farmers, increase production and reduce operating costs as well as to enhance labor efficiency, but it is still out of reach for most developing countries. In recent years, the IoT has made remarkable progress and is regarded as the most promising technology for propelling agriculture, i.e. farming, fishing and the poultry industry, into the future. However, there are no base stations and Wi-Fi stations in most farming areas, which prevent the application of the IoT in agriculture. In this chapter, an unmanned aerial vehicle (UAV)- wireless sensor network (WSN) based system that has been applied in the rural area in the People’s Republic of China to resolve this issue will be demonstrated. The role of surveillance in agriculture shows great promise such as in biological disaster prevention in forestry and farm plant protection, fisheries etc. Therefore, low cost, real time, large scale and stable surveillance, accurate data acquisition and transmission as well as processing are very crucial for agriculture production and disaster prevention. However, in most rural areas the absence of wireless base stations and Wi-Fi stations is a major obstacle in implementing surveillance systems. That means the data acquired through the Wireless Sensor Network (WSN) cannot be transmitted using wireless communications. An alternative solution is to employ UAV to communicate with the WSN in large areas to get real time data for processing and analysis.

**Motivation:-**

Smallholder farms support more than two billion people worldwide, but many rely on inefficient and environmentally unsustainable agricultural practices. Small changes in agricultural practices can substantially improve productivity and profitability. However, offering farmers standardized agricultural advice has limited effectiveness due to variation in local conditions and farmer characteristics. Traditional extension systems have been unable to incorporate and disseminate this information to farmers, in part due to the high costs of operating in rural areas.

**Existing System:-**

There are several drone based companies which are implementing on this methods.

**Limitations of Existing System:**

➨It requires basic knowledge and skills to operate the agriculture drones.  
➨Most of the drones have less flight time and covers less area. Drones having long flight time and long range are costlier. Drones having more features are also more expensive.  
➨Need to obtain government clearance in order to use it.  
➨It uses same air space as commercial aircrafts and hence may interfere with manned aircrafts if it comes in their flight path.  
➨It is difficult to fly them in extreme conditions.

**Proposed System:-** Drones are small and light aerial vehicles which may fly at extremely high altitudes and carry various **navigation systems** or **recording devices such as RGB cameras, infrared cameras, and other sensors**. Due to their ability to deploy various sensors and capture high-resolution and low-cost images of crop conditions, drones are very useful in farming.

Initially used for chemical spraying, today drones are a great tool for capturing aerial imagery with platform mounted cameras and sensors. Images can range from **simple visible-light photographs to multi-spectral imagery**that can be used to assess different aspects of plant health, weeds, and assets.

To summarize, drones help farmers **optimize the use of inputs** such as seeds, fertilizers, water, and pesticides more **efficiently. This allows timely protection of crops** from pests, **saves time for crop scouting, reduces overall cost** in farm production, and **secures high yield and quality crops**.

**System Requirement Specifications: -**

1 x [Arduino pilot APM 2.8 Flight Control Board for RC Multi-Rotor Drone](https://www.flyrobo.in/ardupilot_apm_2.8_flight_control_board_drone)

1 x [DJI F450 Quadcopter Frame Kit](https://www.flyrobo.in/dji_f450_quadcopter_frame_kit)

4 x [A2212 1000KV Brushless Motor For RC Airplane / Quadcopter](https://www.flyrobo.in/a2212_1000kv_brushless_motor_for_rc_airplane)

4 x 30A Brushless ESC

2 x [1045 Propeller 10in 10x4.5 For Drone](https://www.flyrobo.in/1045_propeller_10in_10x4.5_for_drone)

1 x [Fly Sky FS-CT6B 2.4G 6CH Radio Set System with RX FS-R6B receiver](https://www.flyrobo.in/flysky-fs-ct6b-2.4g-6ch-radio-set-system-with-rx-fs-r6b-receiver)

1 x [APM Pixhawk Power Module with XT60](https://www.flyrobo.in/apm_pixhawk_power_module_with_xt60)

1 x [Nylon Strap Belt for RC Lipov Battery](https://www.flyrobo.in/5pcslots-magic-sticker-20x270mm-rc-lipo-battery-nylon-strap-belt-reusable-antiskid-cable-tie-down-strap-for-rc-lipo-battery)

1 x [3D printed Shock Absorber Anti-vibration Set for APM Pixhawk](https://www.flyrobo.in/anti-vibration-set-shock-absorber)

**Proposed Methodology:**

Flying over the field, the drone takes high-resolution pictures with a camera or sensor. Based on a measured parameter, these images are captured in different bands from visible (color), near-infrared to infrared spectrum. **The collected images are raw data which requires further interpretation.** Immediately after capturing the image, the images are directly sent to the cloud/software where **different prescription maps are created**depending on the operation the farmer wants to perform on the field. The maps can then be uploaded to the specific farm equipment which will **adjust the number of inputs** (seeds, fertilizers, pesticides) that would need to be applied to the field accordingly.

**References: –**

* 1. ["Commercial Operations Branch – Part 107 UAS Operations"](https://www.faa.gov/about/office_org/headquarters_offices/avs/offices/afx/afs/afs800/afs820/part107_oper/). www.faa.gov. Retrieved 2020-07-28.
  2. [**^**](https://en.wikipedia.org/wiki/Agricultural_drone#cite_ref-2) ["Civil drones (Unmanned aircraft)"](https://www.easa.europa.eu/domains/civil-drones-rpas). EASA. Retrieved 2020-07-28.
  3. [**^**](https://en.wikipedia.org/wiki/Agricultural_drone#cite_ref-3) ["No Flying Allowed: The 15 Countries Where Drones Are Banned"](https://uavcoach.com/drone-bans/). UAV Coach. 2020-02-25. Retrieved 2020-07-28.
  4. [**^**](https://en.wikipedia.org/wiki/Agricultural_drone#cite_ref-4) ["Africa Farming Problems Aided With Drone Technology - Drone Addicts"](https://www.droneaddicts.net/africa-farming-problems-aided-with-drone-technology/). Drone Addicts. 2018-03-12. Retrieved 2018-10-27.
  5. [**^**](https://en.wikipedia.org/wiki/Agricultural_drone#cite_ref-5) Ehrenberg, Rachel (2018). ["Eyes in the sky: 5 ways drones will change agriculture"](https://www.knowablemagazine.org/article/technology/2018/eyes-sky-5-ways-drones-will-change-agriculture). Knowable Magazine. [doi](https://en.wikipedia.org/wiki/Doi_(identifier)):[10.1146/knowable-101118-3](https://doi.org/10.1146%2Fknowable-101118-3).
  6. [**^**](https://en.wikipedia.org/wiki/Agricultural_drone#cite_ref-6) Meola, Andrew. ["Exploring agricultural drones: The future of farming is precision agriculture, mapping, and spraying"](https://www.businessinsider.com/agricultural-drones-precision-mapping-spraying). Business Insider.

**Abstract:** Drones are small and light aerial vehicles which may fly at extremely high altitudes and carry various **navigation systems** or **recording devices such as RGB cameras, infrared cameras, and other sensors**. Due to their ability to deploy various sensors and capture high-resolution and low-cost images of crop conditions, drones are very useful in farming.

Initially used for chemical spraying, today drones are a great tool for capturing aerial imagery with platform mounted cameras and sensors. Images can range from **simple visible-light photographs to multi-spectral imagery**that can be used to assess different aspects of plant health, weeds, and assets.

**Drones collect raw data and translate it with algorithms into useful information**. Therefore, they can be used for various applications in farming, such as the monitoring of the following parameters:

* **Crop health**; damage made by pests, colour change due to pest infection
* **Vegetation indices**; leaf area, anomaly detection, treatment efficacy, phenology, yield
* **Plant height**; plant height and density
* **Plant scouting**; plant size, plot statistics, stand number, compromised plots, planter skips
* **Water needs**; water-stressed parts of the field/orchard in need of watering
* **Soil analysis**; nutrient availability for plant nutrient management

To summarize, drones help farmers **optimize the use of inputs** such as seeds, fertilizers, water, and pesticides more **efficiently. This allows timely protection of crops** from pests, **saves time for crop scouting, reduces overall cost** in farm production, and **secures high yield and quality crops**.

Flying over the field, the drone takes high-resolution pictures with a camera or sensor. Based on a measured parameter, these images are captured in different bands from visible (color), near-infrared to infrared spectrum. **The collected images are raw data which requires further interpretation.** Immediately after capturing the image, the images are directly sent to the cloud/software where **different prescription maps are created**depending on the operation the farmer wants to perform on the field. The maps can then be uploaded to the specific farm equipment which will **adjust the number of inputs** (seeds, fertilizers, pesticides) that would need to be applied to the field accordingly.

In the era of precision farming, drones are acting as an **essential technology that will take farming to a completely new level**. They are a cost-effective way to collect data about various crop conditions in a relatively short period of time. Drones have also shown great potential in the ability to **provide sustainable farming, improve yield, and increase overall farm profitability.**

Technology in farming is constantly evolving. Collecting accurate and reliable georeferenced data based on GPS coordinates and automated steering systems, along with the use of remote sensing (drones), is an essential part of precision farming which can optimize both farm productivity and profitability.

Although there are some risks and limitations, [precision farming and related technology](https://blog.agrivi.com/en/post/shaping-the-modern-farming-through-agtech-fusion) have **great potential in dealing with the challenges of a modern farm production** and at the same time protecting natural resources.

**Future Scope**:

UAVs in precision agriculture is still in its early stage and maybe a scope for further development in both the technology and the agriculture applications. Providentially, it is expended that with the development of UAV’S technology, improved image processing techniques, lower costs, flying times, batteries, new camera designs, low volume sprayers, and nozzle types. A significant number of experimental studies of UAV’S based remote sensing for agriculture application. It will be a more prominent advantages of these systems in precision agriculture and environmental monitoring