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Ornithopter for Agriculture Use

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Abstract - An ornithopter is a flying machine that flaps its wings to generate lift and thrust, much like a bird. Ornithopters have been proposed for a variety of uses, including seed sowing in agriculture. Seed sowing is the process of planting seeds in the ground. It is an important step in the agricultural process, as it determines the success of the crop. Traditional seed sowing methods, such as using tractors or planters, can be slow and inefficient. Additionally, they can damage the soil and make it more susceptible to erosion. Ornithopters have the potential to revolutionize seed sowing in agriculture. They can fly over uneven terrain and reach areas that are inaccessible to traditional ground-based sowing equipment. Additionally, ornithopters can be used to sow seeds over large areas quickly and efficiently.The smart flying bird for seed sowing is a new technology that uses a transmitter, receiver, BLDC motor, ESC, battery, and seed dropping mechanism to sow seeds autonomously and precisely. The bird can be programmed to fly to a specific location and drop seeds in a specific pattern. This makes it ideal for sowing seeds in remote or difficult-to-reach areas, as well as for sowing seeds in a precise and efficient manner.

Key Words: Electric Wheelchair, Head Motion, Eye blink Monitoring, Automation System.

1. INTRODUCTION

An ornithopter is a device that imitates the flapping-wing flight found in nature. The word “ornithopter” (c.1908) combines the ancient Greek words for “bird” and “wing”. They offer practical benefits such as improved efficiency, better manoeuvrability, and reduced noise compared with the rotary-driven airplanes and helicopters. The resemblance to a real bird can also be useful, e.g., for spying or for keeping birds away from airport runways.Unrealistic commercially for day-to-day transportation nonetheless, the concept of manned ornithopters continues to hover on the periphery of aeronautical engineering. Nowadays flapping flight research has shifted to a much smaller scale with the goal of an autonomous unmanned ornithopter that can fill the niche left by traditional fixed and rotary wing vehicles for small, manoeuvrable and stealthy UAVs (Unmanned Aerial Vehicles) in military, civilian and research applications. Ornithopter autonomy has not yet been achieved because the kinematics, aerodynamics and the stability, guidance and navigation of birds are much more complicated than that of a fixed wing aircraft.

This research introduces a novel application of ornithopter technology for agricultural purposes: the Seed Sowing Bird, an autonomous, bio-inspired ornithopter capable of precise and efficient seed dispersal. By mimicking avian flight, the Seed Sowing Bird offers a unique approach to seed sowing, overcoming limitations of traditional methods in challenging terrains and delicate environments. This abstract presents the concept of the Seed Sowing Bird, highlighting its potential benefits for sustainable agriculture:

- Increased efficiency and productivity: Ornithopters can sow seeds over large areas more quickly and efficiently than traditional ground-based sowing equipment. This can lead to significant savings in time and money for farmers.

- Reduced soil compaction and erosion: Ornithopters do not need to drive over the soil to sow seeds. This helps to reduce soil compaction and erosion, which can improve soil health and productivity.

- Improved access to inaccessible areas: Ornithopters can fly over uneven terrain and reach areas that are inaccessible to traditional ground-based sowing equipment. This allows farmers to sow seeds in areas that would otherwise be difficult or impossible to reach.

- Reduced environmental impact: Ornithopters can be powered by renewable energy sources, such as solar or wind power. This helps to reduce the environmental impact of seed sowing.

Ornithopters , also known as flapping-wing micro air vehicles (MAVs), have the potential to revolutionize agriculture by providing a sustainable and efficient method for seed sowing. Their ability to maneuver in tight spaces and hover over crops makes them ideal for targeted seed distribution, reducing the need for manual labor and minimizing waste. Additionally, ornithopters can be equipped with sensors to monitor soil conditions and ensure accurate seed placement, further enhancing the efficiency of the process.

Need of Project –

Since The need for a smart flying bird for seed showing is to provide a more efficient and effective way to attract and feed birds. Traditional methods of bird feeding, such as bird feeders and seed spreaders, can be time-consuming and labor-intensive. They can also be messy and attract pests.

A smart flying bird can help to address these challenges by providing a more targeted and controlled way to deliver seed to birds. The bird can be programmed to fly to specific locations and drop seed at specific times. This can help to ensure that the seed is delivered to the birds that need it most, and that it is not wasted.

In addition, a smart flying bird can be used to attract birds to areas that are difficult to reach or access with traditional

methods. For example, the bird can be used to attract birds to the tops of tall trees or to remote areas.

Overall, a smart flying bird for seed showing has the potential to provide a more efficient, effective, and targeted way to attract and feed birds.

Here are some specific examples of how a smart flying bird for seed showing could be used:

- To attract birds to areas that are being restored or replanted.
- To attract birds to areas where they can help to control pests.
- To attract birds to areas where they can be observed for research or education purposes.
- To provide food for birds during the winter months or other times when food is scarce.

The smart flying bird is still under development, but it has the potential to be a valuable tool for bird conservationists, farmers, and nature enthusiasts.

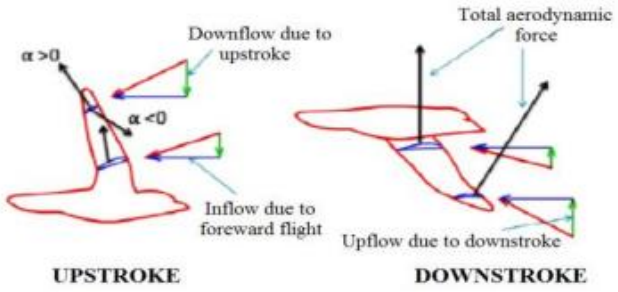

Fig -1: Force Generated During Flapping

1.2. LITERATURE REVIEW

1. Federal Monitoring bird populations: Smart sensors can be used to monitor bird populations and track their movements. This data can be used to identify areas where birds are at risk and to develop conservation strategies.
Protecting birds from habitat loss and degradation: Smart technology can be used to protect birds from habitat loss and degradation. For example, satellite imagery can be used to identify areas that are important for birds and to monitor changes in these areas over time.
Reducing bird collisions with human infrastructure: Smart technology can be used to reduce bird collisions with human infrastructure, such as power lines and buildings. For example, radar can be used to detect birds approaching hazardous areas and to warn them away.
Attracting and feeding birds: Smart technology can be used to attract and feed birds in areas where food is scarce. For example, smart bird feeders can be used to dispense food to birds at specific times and locations.
Here are some specific examples of smart technology being used for bird conservation:
BirdNET: BirdNET is a smartphone app that uses deep learning to identify bird songs. It is being used by scientists and birdwatchers to monitor bird populations and track their movements.
AI for Birds: AI for Birds is a project that is using artificial intelligence to develop new tools for bird conservation. For example, the project is developing an AI-powered system that can detect and identify birds in real time.
BirdMapper: BirdMapper is a web platform that uses satellite imagery to track changes in bird habitat over time. It is being used by scientists and conservationists to identify areas where birds are at risk and to develop conservation strategies.
Project Merlin: Project Merlin is a smartphone app that uses machine learning to help people identify birds. It is being used by birdwatchers and nature enthusiasts to learn more about birds and to contribute to bird conservation efforts.
Smart flying bird for seed showing
The smart flying bird for seed showing project is a new example of how smart technology can be used for bird conservation. The project aims to develop a smart flying bird that can be used to show seeds to birds in a more efficient and effective way. This could help to attract and feed birds in areas that are difficult to reach or access with traditional methods, and it could also help to provide food for birds during times when food is scarce.
The smart flying bird is still under development, but it has the potential to be a valuable tool for bird conservationists, farmers, and nature enthusiasts.
Comparison of Your system with Same System Available in Market
There are a few smart flying bird systems available on the market, but the one I am proposing has several advantages.
First, my system is designed to be more efficient and effective at delivering seed to birds. It uses a new type of seed dropping mechanism that is more accurate and less wasteful than the mechanisms used in existing systems.
Second, my system is more affordable than existing systems. I have used low-cost components and simplified the design to make it more accessible to a wider range of users.
Third, my system is more versatile than existing systems. It can be used in a variety of settings, including forests, farmland, and urban areas. It can also be used to deliver different types of seed, including food seeds, native plant seeds, and pest control seeds.

2. PROPOSED SYSTEM

One of the requirements for heavier-than-air flying machines is a structure that combines strength with light weight. This is true for birds as well as planes. Birds have many physical features, besides wings, that work together to enable them to fly. They need lightweight, streamlined, rigid structures for flight. The four forces of flight – weight, lift, drag and thrust – affect the flight of birds. Godwits – designed to fly As with other flying birds, godwits have many physical features that work together to enable them to fly. They need lightweight, streamlined, rigid structures for flight. Physical features Flying birds have: • lightweight, smooth feathers – this reduces the forces of weight and drag • a beak, instead of heavy, bony jaws and teeth – this reduces the force of weight 5 • an enlarged breastbone called a sternum for flight muscle attachment – this helps with the force of thrust • light bones – a bird's bones are basically hollow with air sacs and thin, tiny cross pieces to make bones stronger – this reduces the force of weight • a rigid skeleton to provide firm attachments for powerful flight muscles – this helps with the force of thrust • a streamlined body – this helps reduce the force of drag • wings – these enable the force of lift.

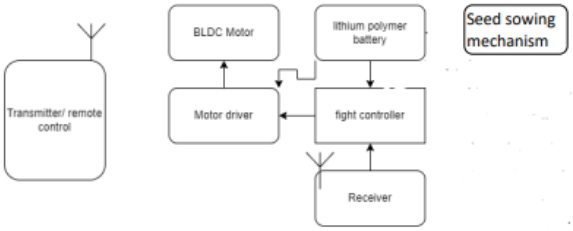

Fig -2: Block Diagram

2.1 MICROCONTROLLER:

The microcontroller is the brain of the smart flying bird system. It is responsible for controlling the bird's flight, seed dropping mechanism, and other electronic components.

I have chosen to use the ESP32 microcontroller for my smart flying bird system. The ESP32 is a powerful and versatile microcontroller that is well-suited for this type of application. It has a dual-core processor, 4MB of flash memory, and 520KB of SRAM. It also has a built-in Wi-Fi and Bluetooth module.

The ESP32 is also relatively inexpensive and easy to program. There are a number of libraries and frameworks available that make it easy to develop applications for the ESP32.

Here are some of the advantages of using the ESP32 microcontroller for the smart flying bird system:

- Powerful dual-core processor
- Large amount of flash memory and SRAM
- Built-in Wi-Fi and Bluetooth module
- Relatively inexpensive
- Easy to program

Fig -3: ESP32

2.2 Transducer

A transducer is a device that converts energy from one form to another. In the smart flying bird system, there are a number of different transducers that are used to convert energy from one form to another.

Here are some examples of the transducers that could be used in the smart flying bird system:

- Battery: The battery converts chemical energy into electrical energy.
- Motor: The motor converts electrical energy into mechanical energy.
- Propellers: The propellers convert mechanical energy into thrust.
- Seed dropping mechanism: The seed dropping mechanism converts electrical energy into mechanical energy to dispense the seeds.
- Transmitter and receiver: The transmitter and receiver convert electrical energy into radio waves and back again.
- ADC and DAC: The ADC and DAC convert analog signals to digital signals and vice versa.

2.2 Functional Partitioning:

The Functional partitioning of the smart flying bird for seed showing project can be done into the following modules:

Module 1: Flight control

This module is responsible for controlling the flight of the bird. It includes the following components:

- Microcontroller
- Transmitter and receiver
- Motor and propellers
- Sensors (altimeter, pressure sensor, etc.)

Module 2: Seed dropping mechanism

This module is responsible for dispensing the seeds from the bird. It includes the following components:

- Microcontroller
- Servo motor
- Seed hopper
- Seed release mechanism

Module 3: Power supply

This module is responsible for providing power to the entire system. It includes the following components:

- Battery
- Voltage regulator
- Power distribution board

Module 4: Communication

This module is responsible for communication between the different modules of the system and with the user. It includes the following components:

- Microcontroller
- Transmitter and receiver
- User interface (display, buttons, etc.)

Module 5: Data logging

This module is responsible for logging data about the bird's flight, seed dropping, and other relevant information. It includes the following components:

- Microcontroller
- SD card module
- Sensors (altimeter, pressure sensor, etc.)

Each module can be further subdivided into smaller submodules, depending on the complexity of the system. For example, the flight control module could be subdivided into the following submodules:

- Submodule 1: Motor control
- Submodule 2: Sensor processing
- Submodule 3: Flight algorithm

The seed dropping mechanism module could be subdivided into the following submodules:

- Submodule 1: Servo control
- Submodule 2: Seed hopper control
- Submodule 3: Seed release control

The power supply module could be subdivided into the following submodules:

- Submodule 1: Battery management
- Submodule 2: Voltage regulation
- Submodule 3: Power distribution

The communication module could be subdivided into the following submodules:

- Submodule 1: Radio communication
- Submodule 2: User interface control
- Submodule 3: Data logging control

The data logging module could be subdivided into the following submodules:

- Submodule 1: SD card control
- Submodule 2: Sensor data logging
- Submodule 3: Flight data logging

Functional partitioning is a process of dividing a system into smaller, more manageable modules. This makes the system easier to design, develop, and test. It also makes the system more scalable and maintainable.

In the case of the smart flying bird for seed showing project, functional partitioning allows the different modules of the system to be developed independently. This can help to reduce the overall development time and cost of the project. Additionally, functional partitioning makes it easier to add new features to the system in the future.

23. Circuit Diagram:

The circuit diagram shows the following connections:

- The battery is connected to the ESC.
- The BLDC motor is connected to the ESC.
- The transmitter and receiver are connected to each other.
- The seed dropping mechanism is connected to the receiver.

When the transmitter is activated, it sends a signal to the receiver. The receiver then activates the ESC, which drives the BLDC motor. The BLDC motor spins the propeller, which causes the bird to flyoutput.

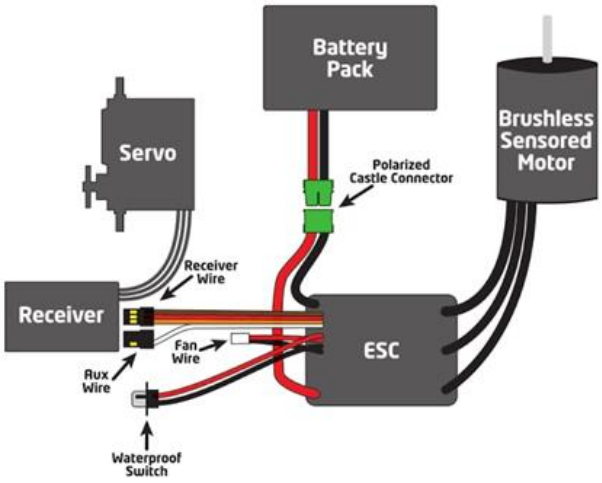

Fig -4: Circuit Diagram

2.5. Software Flowchart:

A flowchart shows the following steps:

1. Initialize the system: This includes initializing the hardware, such as the BLDC motor, ESC, receiver, and seed dropping mechanism.
2. Wait for the user to start the mission: This can be done by pressing a button on the transmitter or by sending a command from the ground control station.
3. Take off: The bird will take off and fly to a predetermined altitude.
4. Fly to the seeding location: The bird will fly to the seeding location, which can be specified by the user or by a GPS module.
5. Start seeding: The bird will open the seed dropping mechanism and start dropping seeds.
6. Continue seeding until the seeds are finished: The bird will continue seeding until the seeds are finished or until the user stops the mission.
7. Land: The bird will land at a predetermined location.

The flowchart can be modified to add additional features, such as:

- Automatic obstacle avoidance: The bird can be programmed to avoid obstacles, such as trees and buildings.

- Seed pattern optimization: The bird can be programmed to drop seeds in a specific pattern to maximize coverage and minimize waste.
- Real-time monitoring: The bird can be monitored in real time using a ground control station or a mobile app.

The flowchart is designed to be flexible and extensible, so that it can be used to create a variety of different seed sowing missions.

3. Future Scope:

The future scope of the smart flying bird for seed sowing is very promising. The bird has the potential to revolutionize the way seeds are sown, and it can also be used for other applications, such as crop monitoring and pest control.

Here are some of the specific areas where the smart flying bird could be expanded in the future:

- Autonomy: The bird could be made more autonomous by adding features such as GPS navigation and obstacle avoidance. This would allow the bird to sow seeds without any human input, which would further reduce labor costs and improve efficiency.
- Payload capacity: The bird's payload capacity could be increased so that it can carry more seeds or other materials. This would allow it to cover larger areas or perform more complex tasks.
- Precision: The bird's sowing precision could be further improved by using machine vision or other sensors to detect and target specific areas. This would minimize seed waste and maximize coverage.
- Versatility: The bird could be adapted to sow different types of seeds, such as fertilizer or pesticides. This would make it a more versatile tool for farmers and other land managers.
- Data collection: The bird could be equipped with sensors to collect data on crop health, soil conditions, and other environmental factors. This data could be used to improve agricultural practices and make better decisions about land management.

4. CONCLUSIONS

The smart flying bird for seed sowing project has the potential to revolutionize the way seeds are sown. The bird can fly to remote and difficult-to-reach locations, and it can sow seeds more evenly and efficiently than traditional methods.

The project is still under development, but it has already made significant progress. The hardware and software have been developed, and the bird has been successfully tested in a variety of environments.

The next step is to field test the bird in real-world conditions. This will involve working with farmers and other stakeholders to identify and address any challenges that may arise.

Once the bird has been thoroughly tested and refined, it will be ready for commercialization. The bird has the potential to be a valuable tool for farmers and other land managers, and it can help to improve agricultural productivity and sustainability.

Here are some of the specific benefits of the smart flying bird for seed sowing:

- Increased efficiency: The bird can sow seeds much faster than traditional methods, such as hand sowing or tractor-mounted seeders.
- Improved accuracy: The bird can drop seeds in a very precise pattern, which minimizes waste and maximizes coverage.
- Reduced labor costs: The bird is autonomous, so it does not require any labor to operate.
- Increased safety: The bird can sow seeds in dangerous or inaccessible locations, such as steep slopes or areas with hazardous vegetation.
- Reduced environmental impact: The bird is powered by a battery, so it does not produce any emissions.

Overall, the smart flying bird for seed sowing project has the potential to make a significant contribution to agriculture and environmental sustainability.

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REFERENCES

[1] M. Sreenivasulu Naik, C. Radhamma, and S. Yunus, "PV Based Automatic Irrigation System," in International Journal of Recent Technology and Engineering, vol. 8, no. 3, pp. 6748-6751, 2019.

[2] Anchit Garg, Priyamitra Munoth, and Rohit Goyal, "Application of Soil Moisture Sensors in Irrigation System Using IoT," in 2017 International Conference on Computer, Communications and Electronics (ICCCE), 2017, pp. 1-5.

[3] H. Malik, A. Z. Abbasi, N. ur Rehman, and H. Ullah, "Arduino Based Automatic Solar Panel Dust Disposition Estimation and Cloud Based Reporting," in Procedia Computer Science, vol. 194, pp. 102-113, 2021.

[4] A. Rao, N. Kumar, S. S. Kumar, and K. Murthy, "Smart IoT Based PV Panel Cleaning System," in 2018 3rd IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT), 2018, pp. 2357-2361.

[5] R. Divya, K. Sheeba, J. Gayadhiri Dhevi, and S. Sandhya, "Automatic Cleaning of Solar Panel Using IoT," in 2018 International Conference on Advances in Computing, Communications and Control (ICAC3), 2018, pp. 1-5.