

Irrigation through Air Drop Drones

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Abstract: Agriculture is the dominant source for food in this world. In India agriculture is backbone of this country and is our ancient tradition also. Now-a-days agriculture is ruining due to lack of rains and insufficient water source that means inefficient irrigation to crops. Due to deficiency of irrigation to crops, production of crop is diminishing daily. Some farmers are committed suicide due to decreasing crop production.

Now a day the population is increasing day by day life then there a need of lot's of food crops to satisfy the today population. There is a need of a new technology in agricultural system by using drones, i.e. "Air Drop Drones". This can irrigate by using this type of drones. This drones works by nano solar panels to do irrigation by using moisture in air. Automatically this drone converts air into water molecules and afterword's drone will spray these molecules on the crop by using a nozzle. By using this type of irrigating air drop drone, crop production has to be enlarged gradually within a short period time as well as less cost, that should be every farmer can bear. In this project mainly the solar power is main source to drive motors and turbine.

Keywords: Nano solar panels, brushless motors, Propellers, Turbine, condensers.

Introduction

India economy is mainly depend up on the agriculture systems but now a days the agriculture systems is not so efficient. The main important reason is a lack of rain due to the global warming and scarcity of water in a reservoir. That can be demolished by adopting a new technology, agricultural irrigation system by drones; it will automatically irrigate the crop area by taking air as a water source. This is created by using high-technology and the power source is generated by the nano solar panels.

In this journal, work is goes on a research towards irrigating the crops. Due to lack of underground water, drone took air as a source to provide water to crops. So that a device is developed that converts air into water but that needs more air to irrigate large lands. For this purpose an aerial drone is selected because, aerial drone medium is air and this air is what should want. In this, drone is worked under lithium polymer battery which is less weight and store more power, so this battery is preferable. In this air drop drone, use brushless motors which consume less power and runs at high speed. To these brushless motors there will be propellers.

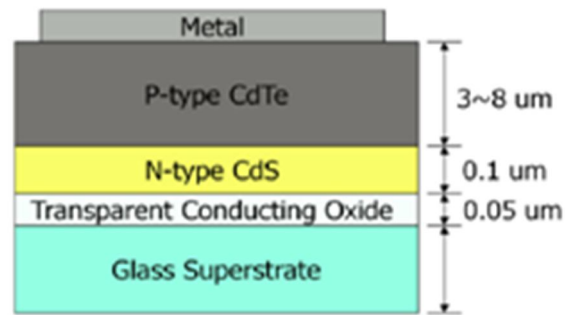
Description of Components

1. Nano Solar Panels
2. Battery
3. Microcontroller (ATMEGA 328)
4. Brushless Motors
5. Propellers
6. Turbine
7. Condenser
8. Spray Nozzles

Nano Solar Panel: It is shown in figure 1.

- 1 Sun Light passes to the middle semiconducting ink layer, which breaks up the electrons.
- 2 The molybdenum on the fourth layer acts as an electrode, and as the end of the circuit.
- 3 The second layer is a P/N junction, which conducts the electrons through to the top layer.

- 4 The top layer conducts the electrons and work as the beginning of the circuit.



Battery

Lithium Polymer battery is used in this drone because, it is mostly used for drones. It has got really good specifications that are suitable to drone. Lithium Polymer battery is shown in below figure 2 and 3.

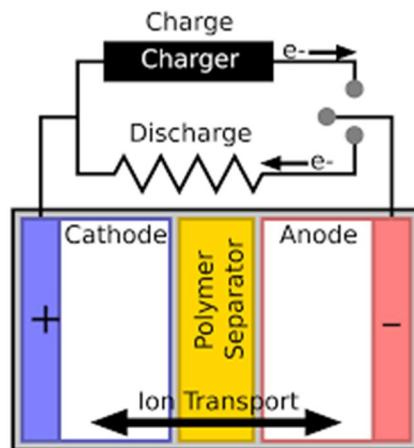


Figure 2

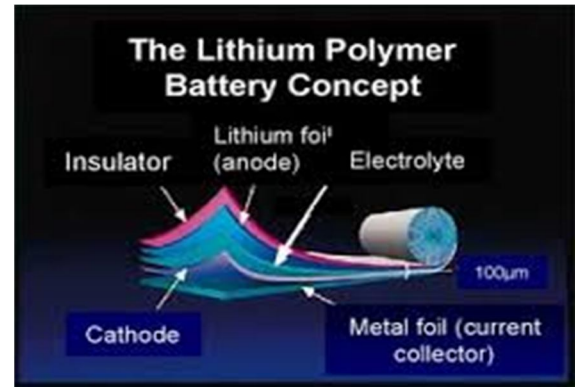


Figure 3

Battery Notation

Capacity per cell: 5000mAh

Number of cells: 4

Nominal Voltage: 14.8v

Cell Voltage

Full Charge: 4.2 volts per cell

Nominal: 3.7 volts per cell

Discharged: 3.5 volts per cell

Discharging a LiPo battery past this level will result in permanent damage.

Micro Controller

A Microcontroller is a small computer on a single integrated circuit. In modern terminology, it is a System on a chip or SoC. A microcontroller contains one or more CPUs along with memory and programmable input/output peripherals. Program memory in the form of Ferroelectric RAM, NOR flash or OTP ROM is also often included on chip, as well as a small amount of RAM. Microcontrollers are designed for embedded applications, for our applications these are preferred ATMEGA 328 microcontroller. Block diagram of ATMEGA328 Microcontroller is shown below figure 4.

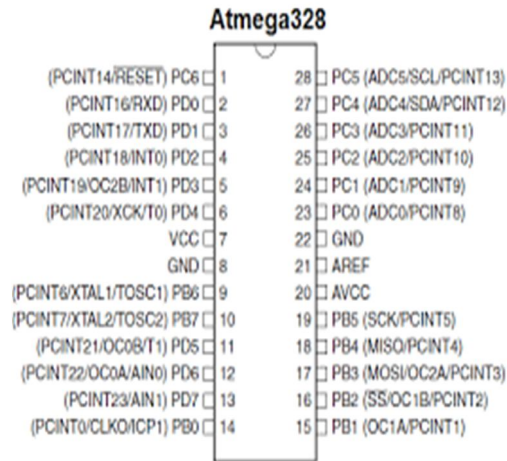


Figure 4

Specifications of ATMEGA 328 microcontroller is shown below table 1

Table 1

FEATURES	ATMEGA328
Pin count	28/32
Flash(bytes)	32K
SRAM(bytes)	2K
EEPROM(bytes)	1K
Interrupt vector size	1/1/2
General purpose I/O lines	23
SPI	2
TWI	1
USART	1
ADC	10-bit 15SPS
ADC channels	8
8-bit timer/counters	2
16-bit timer/counters	1

Brushless Motors

In order to make the operation more reliable, more efficient and less noisy the recent trend has been to use brushless D.C (BLDC) motors. They are also lighter compared to brushed motors with the same power output. In a brushless DC motor (BLDC), you put the permanent magnets on the rotor and you move the electromagnets to the stator. Then you can use a computer (connected to high-power transistors) to charge up the electromagnets as the shaft turns.

There are some sorts of advantages

1. If a computer controls the motor instead of mechanical brushes, it's more precise. The computer can also factor the speed of the motor into the equation. This makes brushless motors more efficient.
2. There is no sparking and much less electrical noise.
3. With the electromagnets on the stator, they are very easy to cool.
4. You can have a lot of electromagnets on the stator for more precise control and there are no brushes to wear out.

Brushless motor is shown in the figure 5.



Figure 5

Motor Ratings

Brushless out runner motors are rated in KV per RPM, this is usually specified as just KV. For racing and acrobatics a good starting point in motor selection is to consider motors that are rated over 1200kv and for heavy payloads motors, those are rated under 1200kv (850kv is a nice starting Point for heavy payloads). For drones weighing more than 1kg use a motor in the range of 700-900kv between 500gms-1kg, use motors between 900-1300kv and for craft below 500gms motor around 1300- 2200kv are used.

Here, for this 850kv motor is to be used, which is usually found in the heavy use of payloads.

Electronic Speed Controllers

Electronic Speed Controller (ESC) is an electronic circuit to vary the speed, direction and possible to act as a dynamic brake of a Brushless Motors. Electronic Speed Controllers are an essential component of modern quad copters (and all multirotors) which offers high power, high frequency, high resolution 3-phase AC power to the motors in an extremely compact miniature package.

The latest ESC innovation was on the DJI Inspire 1 which uses new sinusoidal drive ESC, it replaces the more square wave drive of traditional ESCs. The Inspire 1 goes further by using closed loop torque control and distinct functional redundancy which adds extra efficiency and reliability to the motors.

Propellers

These props pull the quad copter through the air like a tractor. While some drones like the DJI Phantom look more or less the same from any angle, there is a front and back. Most drone propellers are made of plastic and the better quality made of carbon fiber. In a drone there are two propellers. Normal propellers will help in altitude flight and pusher propellers are helpful to move forward. Propellers are shown in figure 6.



Figure 6

Pusher Propellers

The Pusher props are at the back and push the way forward hence the name "Pusher props". These contra-rotating props exactly cancel out motor torques during stationary level flight. Opposite pitch gives downdraft. Again, it can be made of plastic with the better pusher props made of carbon fiber. You can also purchase guards for the pusher prop.

Turbine

In this Air Drop Drone wind turbine is used. A wind turbine is a device that converts the wind's kinetic energy into electrical power. A turbine works, like a typical wind turbine with three upwind blades spinning to generate electricity. Then in a separate

process, air is sucked into the turbine's nose and sent through a cooling compressor, which extracts moisture from the air. The main purpose of the turbine is that should extract air from surroundings, For this purpose vertical axis wind mill is to be selected. To the vertical axis wind mill intake fan is connected to draw air from the surroundings atmosphere. Turbine and intake fan is shown in figure 7.

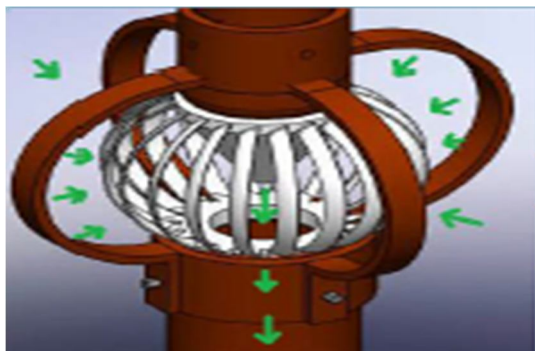


Figure 7

Super Air Condenser

A condenser is a device or unit used to condense a substance from its gaseous to its liquid state, by cooling it. From the below figure you will get a clear idea about super air condenser. Super air condenser is shown in figure 8.



Figure 8

Spray Nozzles

A spray nozzle is a precision device that facilitates dispersion of liquid into a spray. Nozzles are used for three purposes: to distribute a liquid over an area, to increase liquid surface area, and create impact force on a solid surface. In this Air Drop Drone a Pressure Swirl Single Fluid Spray Nozzle is used.

Pressure-swirl spray nozzles are high-performance (small drop size) devices, these are stationary core induces a rotary fluid motion which causes the swirling of the fluid in the swirl chamber. A film is discharged from the perimeter of the outlet orifice producing a characteristic hollow cone spray pattern. Air or other surrounding gas is drawn inside the swirl chamber to form an air core within the swirling liquid. Many configurations of fluid inlets are used to produce this hollow cone pattern depending on the nozzle capacity and materials of construction. The uses of this nozzle include evaporative cooling and spray drying. These are shown in figure 9 and 10.

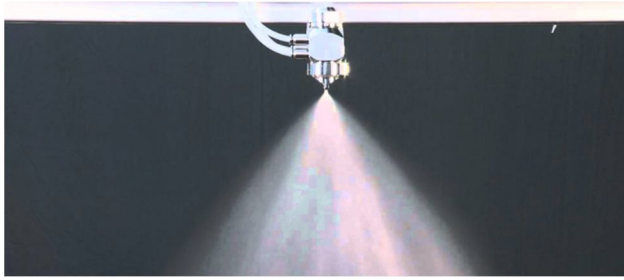


Figure 9

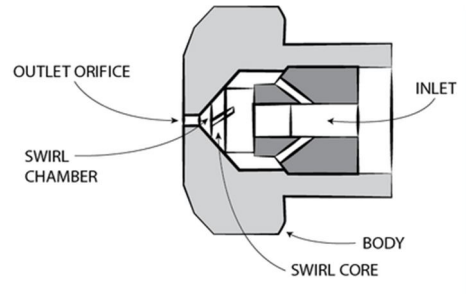


Figure 10

Working of Drone

A quad copter also called a quad rotor helicopter or quad rotor is a multi rotor helicopter that is lifted and propelled by four rotors. Quad copters are classified as rotor craft as opposed to fixed wing aircraft because their lift is generated by a set of rotors (vertically oriented propellers).

Basically a Quad copter is a quad rotor helicopter that is lifted and propelled by four rotors. Unlike helicopters they use symmetrically pitched blades. Control of vehicle motion is achieved by altering the pitch and/or rotation rate of one or more rotor discs, thereby changing its torque load and thrust/lift characteristics. As you can see, the motors 1 and 4 rotate in CW direction while 3 and 2 rotate CCW thus creating a downward thrust, which lifts the quad copter by varying the speed of the 4 rotors various movements are possible. There are three important terms mentioned above namely the YAW, ROLL and PITCH which must have a clear concept of before understanding the quad's movement.

Working of Air Drop Drone

Mainly Air Drop Drone purpose is to irrigate crops and to solve water problems for people mainly farmers.

1. First drone is mainly made by Aluminium which is very light material and gives good strength to drone. So Aluminium is used to manufacture this Drone.
 2. The main Source to this drone is nano solar panels which works very efficiently and gives enough power to run motors and remaining power is stored in battery. To store power developed by nano solar panels we used a Lithium Ion battery which can charged in 2-3 minutes and the battery life is more.
 3. The power stored in the battery is directly sent to brushless motors. This motors works efficiently and consumes less power than other type of D.C motors.
 4. In our drone i.e. Quad copter there are four motors. In these four motors, two motors runs clock wise and the other two runs in Anti-clock wise. To these motors propellers are connected i.e. four propellers. In this four propellers there are two types of propellers. One is Normal propeller and the second one is Pusher propellers.
 5. In this Drone a Microcontroller ATMEGA328 is used, which works very efficiently.
 6. In this Drone electronic speed controllers are used, which usually used to control the drone. Our drone does not need any human need. According to the instructions send by the microcontroller the electronic speed controllers will control the drone.
 7. In this Air Drop Drone there is small vertical axis wind turbine and the fan is connected to this turbine. This fan draws air from the surrounding atmosphere. In the air there will be moisture and that moisture is converted in to water.
 8. The output of the fan is in the form of hot thin air and this air is sent into the super air condenser. This super air condenser converts the hot thin air in to liquid drops.
 9. This liquid drops are collected by the sprayer and spray the liquid or water through nozzles in the crop field.
- This is the working of Air Drop Drone.

Advantages

1. Quad Copter is a standard type.
2. Easy to set up
3. Cheaper than the rest
4. Good maneuverability
5. Solves water problems and provides irrigation to crops
6. Provide drinking water for human consumption also by collecting water from nozzles.
7. Even in the driest regions provide water.
8. Time and labor cost is decreases.

Disadvantages

1. Highly sensitivity.
2. Initial Cost is high.

Applications

1. Very efficient for Paddy, Rice fields
2. It can be used in an irrigation fields

Conclusion

In this project our main aim to irrigate crop fields and to increase crop production. For this increasing of crop production, constructed a drone that runs on solar power and irrigates the crop fields through creating water molecules from air. So there is infinite amount of water molecules content in air in the form of humidity. Through this irrigating the crops has been held. So finally, anyone can see the increasing the crop production by providing water to the crops.

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