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Design and Implementation of Sanitization Drone System

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Abstract: *Quadcopter are slowly finding its way into various sector applications including security, oil & gas, public health, etc. This Aerial Vehicles provides faster and reliable solutions for many real time challenge and day to day life problems. Spraying sanitizers using drone is one such solution especially in COVID-19 pandemic situation. Quadcopter is designed to carry up to 2.5 litres of sanitizer in its reservoir and the sanitizer spray system is designed to spread the liquid as droplets at a constant flow rate. quadcopter is made of carbon fibre material and equipped with autonomous module as flight controller. The UAV can be operated in both manual and autonomous modes to increase the relieve of operation for indoors as well as in outdoors sanitization process.*

Keywords: *Quadcopter; Sanitization; Social Welfare; Economical*

I. INTRODUCTION

This project is based on sanitization using drone. The drone, which the most important elements are frame, propellers, engine, system of power the electronic control and communication system. The residence time of the drone flying in the air depends both on the type of drive and the type of power supply. Propellers mounted on arms increases the strength of a drone allowing more thrust and lift capacity and insuring the parallel engine in case of a failure. Thus, the own weight of quadcopter is reduced, the material costs are falling and the drone can carry a heavier load. The size of the wings is very important. The larger is the diameter; the lower is the speed, and thrust which contributes to a reduction of drone volatility. The larger the wing blades, the greater aerodynamic lift generated. This project helped us to understand the mechanical, electrical and control system configuration that goes into building and flying a Quadcopter. We understood the PID automation control mechanism using which the Quadcopter tries to stabilize itself for a smoother flight.

A. Components And Design

- 1) **Frame:** It is the structure that holds or houses all the components together. They are designed to be strong and light weight. To decide the appropriate frame for the copter 3 factors i.e. weight, size and, materials used are considered. The frame should be rigid and able to minimize the vibrations from the motors. It consists of -
 - a) The center plate where the electronics components are mounted.
 - b) Four arms mounted to the center plate.
 - c) Four motor brackets connecting the motors to the end of the arms.

Frames are usually made of:

- Carbon Fiber- It is the most rigid and vibration absorbent but it is the most expensive too.
- Aluminium- Hollow aluminium square rails are the most popular for the arms due to its light weight, rigidness and affordability. However aluminium can suffer from motor vibrations.
- Wood/Plywood/MDF(Medium density fibreboard)- Wood boards like MDF plates could be used for the arms as they are better at absorbing the vibrations than aluminium. Unfortunately the wood is not very rigid material and can break easily if the quadcopter crashes.



2) *Rotors Or Motors:* The purpose of motors is to spin the propellers. DC motors provide the necessary thrust to propel the craft.

Each rotor needs to be controlled separately by a speed controller.

A2212 Brushless motor is used in the quadcopter. Ratings of motor:

Kv: 1000 RPM/V

Max. efficiency: 80%

Max. efficiency current: 4-10 A (<75%) Max. watts : 150 W

Weight: 52.7 g

Poles: 14

The brushless motors do not have a brush on the shaft which takes care of switching the power direction in the coils, and that's why they are called brushless. Instead the brushless motors have three coils on the inner (center) of the motor, which is fixed to the mounting. Brushless motors spin in much high speed and use less power at the same time. Also they don't lose power in the brush transition like the DC motors do, so its more energy efficient.



Figure 1) Rotors or Motors

3) *Battery- Power Source:* 2200 mAH Li-po(Lithium Polymer) battery is used because it is light. NiMH(Nickel Metal Hydride) is also possible. They are cheaper, but heavier than LiPo. LiPo batteries also have a C rating and a power rating in mAH. The C rating describes the rate at which power can be drawn from the battery and the power rating describes how much power the battery can supply.



Figure 2) Battery

4) *Flight Controller:* The flight controller board is regarded as the brain of the quadcopter. It houses sensors such as the gyroscopes and accelerometers that determine how fast each of the quadcopter's motors spin. Flight control boards range from simple to highly complex. An affordable, easy to set up, having a strong functionality controller is always recommended. Such controllers can handle about any type of multirotor aircraft.



Figure 3) Flight Controller

- 5) *ESC – Electronic Speed Controller*: The electronic speed controller controls the speed of the motor or tells the motors how fast to spin at a given time. For a quadcopter, four ESCs are then connected directly to the battery through a power distribution board. Many ESCs come with a built-in battery eliminator circuit (BEC), which allows to power things like the flight control board and radio receiver without connecting them directly to the battery. Because of the motors on the precise speeds to achieve accurate flight, the ESC is very important. The frequency of the signals also vary a lot, but for a quadcopter it is preferred if the controller supports high enough frequency signal, so the motor speed can be adjusted quick for optimal stability.



Figure 4) Electronic Speed Controller

- 6) *Propellers*: A quadcopter has four propellers, two propellers that spin counter-clockwise, and two propellers that spin clockwise. By making the propeller pairs spin in each direction, but also having opposite tilting, all of them will provide lifting thrust without spinning in the same direction. This makes it possible for the copter to stabilize the yaw rotation, which is the rotation, which is the around itself. The propellers come in different diameters and pitches (tilting effect). The larger diameter and pitch is, the more thrust the propeller can generate. It also requires more power to drive it, but it will be able to lift more weight.



Figure 5) Propellers

- 7) *Radio Transmitter And Receiver*: The radio transmitter and receiver allows to control the quadcopter. Four channels for a basic quadcopter is required. Using a radio with 8 channels, so there is more flexibility and recommended. Quadcopters can be programmed and controlled in many different ways but the most common ones are by RC transmitter in either Rate (acrobatic) or stable mode. The difference is the way the controller board interprets the orientations feedback together with the RC transmitter joysticks.



Figure 6) Radio Transmitter And Receiver

- 8) *Jets and Sprays*: Surfaces that are not accessible for mopping can be cleaned using jets and sprays. An aerosol created using disinfectant and the base fluid combination can be used to spray the inaccessible areas. The nanometer-sized corona embedded in micron sized cough droplets can easily reach inaccessible areas when an infected person coughs or sneezes. So a proper use of spray and jet should be employed to disinfect such inaccessible surfaces.

II. SOFTWARE

A. Arduino IDE

This software is required to program both transmitter-receiver Arduino UNO as well as ESP32 AI . Radiohead and MLX90614 Libraries are necessary to program Transmitter and MLX sensor respectively. To program the esp board must be selected in the tool box window .The serial monitor gives IP address os the camera and real time sensed body temperature.

III. LITERATURE

Sanitization is a practical approach to tackle the issues associated with infection and contamination. The crucial requirement of sanitization in recent pandemic time brought an area of active research to cater to any health issues in the future spread of unpredictable disease(s). Sanitization as an area of interdisciplinary research needs a central focus in the longer and better run. One should address the community level spread of disease at individual scales before handling it on a social scale with care. Individual sanitization helps in decreasing the mammoth spread of virus and stop it from taking a colossal shape for the society as a whole. Crowd is made of individuals who are a part of a crowd itself and so it is on every individual to act for the benefit an help of the larger group. Masks and etiquettes of sneezing have been largely promoted since the outbreak of a pandemic. Different regulatory bodies along with government have also stressed the central role of hand sanitization.

For the disinfection of the hand, alcohol-based hand rub or soap with water are preferred according to (WHO 2020b). The alcohol-based hand rubs are mainly formulated with ethanol, pro- pan-2-ol or propan-1-ol. Some of the hand sanitizers also contain additional chemicals such as triclosan, chlorhexidine for better results.

IV. APPLICATIONS

Quadcopter has variety of applications in the field of the research, military and many more. Their small size and agile manoeuvrability prove a great strength to these quad copters and they can flown indoor as well as outdoors.

They use an electronic control system and electronic sensor to stabilize the aircraft.

Some applications are –

A. Agriculture

Quadcopter 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.

B. Sanitization

This quadcopter is capable to sanitize the small area in hospitals containment zones etc. due to its construction, size and the weight it can carry.

V. BLOCK DIAGRAM

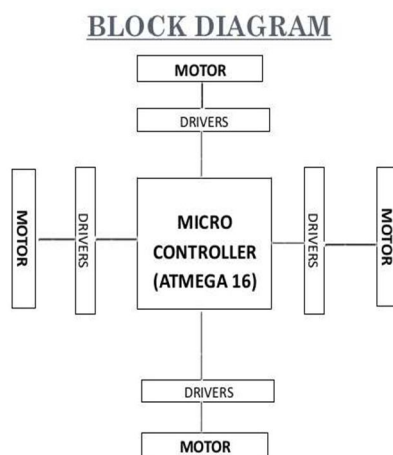


Fig .1



Fig.1

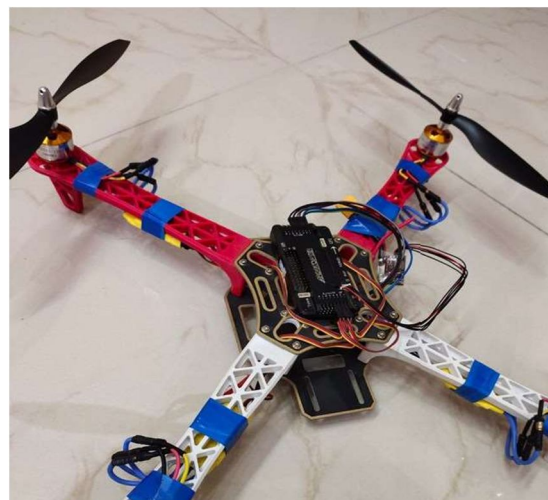


Fig.2

VI. DISCUSSION

- A. The main points is that with growing progress in technology , drones too are coming in different shapes , sizes and configurations for better stability Moreover , extended components like camera , GPS tracker made it easy in mission completion, search surveillance etc.
- B. After 10 years , the market for drones well reach \$1.7 Billion .Each year , \$6.4 billion is being spend on developing drone technology the drone are even providing new job opportunities .70000, new drone related projects within next three years are going to start itself in U.S.A alone . So no need for people to be in fear about losing their jobs because of replacement by robots and drones in forthcoming future

Since the advantage of quadcopter technology are more than its disadvantages , then according to drone experts , drones will be ‘‘ is trends ‘‘ within next 10 years to 15 years ahead .

There is a wide scope that with its extending use in almost every field and with greater powerful components, drones will surely come into full time existence in upcoming future.

VII. RESULT

Drones will soon be an imperative existence in the forthcoming future. They will be seen taking up major roles for the variety of business in the upcoming future. They could become a part of our day to day lives, from smaller details to major answers.

Most drones are controlled by either software or other computer programs. The components of a drone also vary as it is based on what type of work needs to be done and how much payload needs to be carried.

Batteries, electronic speed controller etc, all come in different ranges according to the type of work needed by the quadcopter.

Quadcopters are a major provisional craft that could get in between airplanes and big helicopters and are hence easier to fly as required. Quadcopters offer to be a great balance between cost, capability, and performances.

The only problem is when funds are required and coupled with highly ambitious projects like ours.

Hence quadcopters have a great future; the onus lies upon us whether we productively use it or destructively.

Quadcopters are drones first come as an application as small toys or school projects and then no sooner began to gain widespread attention, used in big-budget movies, photography, agriculture use as to rectify lands and detect levels of pesticides required to sanitize if required, as well as search and rescue, land mapping, military etc.

The commercial as well as private use of drones is enlarging.

Quadcopter drone can effectively carry 2.5 liters of sanitizer and fly for 20 minutes with 2200 mAh battery.

Larger area can be disinfected with smaller man work force and in a short duration.

Improved safety for the personnel working in the disinfection process and area.

VIII. CONCLUSION

The centrality of sanitization as a means of controlling the spread of pandemic is established when we evaluate the no. of methods of sanitization employed to work in the COVID-19 pandemic. The categorisation of sanitization depends on the ways of infection. Three possible ways of infection (i) direct, (ii) indirect and (iii) airborne transmission have been come out as the cause of spread of this pandemic. Individual, object and space sanitization are needed to stop the spread of COVID-19 at present situation. The end goal of any sanitization process is to removal of the virus and inactivate it. Mechanical removal, thermal treatment and chemical disinfection are used in isolation or in combination in the listed categories of sanitization. On an individual level, hand washing and oral hygiene are highly recommended especially in these situations. Masks have become an important part of attire to stop the spread of virus and sanitization of masks has become a scientific concern. Heat treatment like baking, microwave steam heating; UV irradiation and chemical treatment using vaporised hydrogen peroxide, ozone gas has been recommended as well. Spaces and objects can be disinfected using mops/wipes, jets and sprays, UVC irradiation, fogging and fumigation etc. Ventilation and filtering of contaminated air is an important means of sanitizing high-risk zones like hospitals containment zones and restaurants. Can be used in agriculture as well. Since the majority of the processes come with added risks to health due to chemical or radiation overuse, a balanced and non-obsessive sanitization behaviour is recommended. Sanitization based research is a void where technologies and research other than those focused on chemical disinfectants can play a crucial role.

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