Implementation of Drone Technology in IT Organizations

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ABSTRACT

Indian organizations/companies use wide range of technologies to give better support to their employees. Outside India most organizations uses drone technology to provide security, for product delivery, for observation purpose and so on. Drones are small, lightweight, less expensive system we can use in our organizations to maintain employee's health as well as to provide security. This article provides detailed understanding of how we can use drone in organization. Also provide information about different parts of drone and how they work. These articles also help us to figure out the amount of hours people spend in workplace and ensure security.

Keywords : UVA, RUAV, Drone, Stress detection, Employee security, Hovering, Sky surveillance.

I. INTRODUCTION

Concept behind drone is to use a flying vehicle or motor without human pilot. In another words more technically, we can call drone as "Unmanned Aerial Vehicle (UAV)". Drone is evolution of primary concept of UAV's. UAV was first developed or manufactured by Americans Lawrence and Sperry in 1916.

"They developed a gyroscope to stabilize the body, in order to manufacture an autopilot. This is known as the beginning of "attitude control" which came to be used for the automatic steering of an aircraft, where attitude control is controlling the orientation of an object with respect to certain fields and a nearby object, etc.[[1]]

UAV innovations started in the early 1900s. UAV development continued during World War I. Originally Drones are designed for a military purpose, their use is rapidly expanding to commercial, scientific, recreational, agricultural, and other applications, such as peacekeeping, product deliveries, aerial photography, agriculture, smuggling, etc.

Where the term "Drone" is used by people, was in reference to early remotely-flown target aircraft. We can define "Drone' as a powered, aerial vehicle that does not contain human to operate, uses aerodynamic forces to vehicle lift, can fly autonomously(without human operation) or be piloted remotely.

Behind various Drone designs and concepts there are main four platforms as follows:

1) **Fixed-wing UAVs:** which allude to unmanned planes (with wings) that require a runway to take-off and land, or sling propelling. These for the most part have long perseverance and can fly at high cruising speeds.[**Error! Reference source not found.**]

2) **Rotary-wing UAVs:** likewise allude to rotorcraft UAVs or vertical take-off and landing (VTOL) UAVs, which have the ability of drifting and high mobility. These abilities are valuable for some mechanical missions.[**Error! Reference source not found.**]

3) Blimps: such as balloons and airships, which are lighter than air and have long endurance, fly at low speeds, and generally are large sized.[**Error! Reference source not found.**]

4) Flapping-wing UAVs: which have flexible and/or morphing small wings inspired by birds and flying insects.[**Error! Reference source not found.**]

Here we consider Rotary-wing UAV which are suitable for our need. Rotorcraft Unmanned Aerial Vehicles (RUAVs) are small autonomous aerial vehicles, being widely used in many applications. Miniature RUAVs offer major advantages, their usefulness results from their low-cost, small size, VTOL (Vertical Take-Off and Landing) capabilities and their ability to fly in very low altitudes, hover, cruise and achieve aggressive maneuvers. As mini RUAV's has many designs and implementation challenges, but by accepting these challenges we can create a different version of RUAV's. There are many evolutions in design and implementation in drones till date.

II. LITERATURE REVIEW

The Unmanned Aerial Vehicle or Drone research paper required extensive research into similar system. By reviewing others work, we used this insight to develop our paper. To this end, research papers from various UAV's groups were used as guides in the early development of the dynamics and control theory.

UAV's platforms used in research remain somewhat the same, having four electric motors. Pointed vertically upwards and equally spaced in a square fashion having camera, sensors mounted on face of drone with antennas.

Many researchers till now proposed different applications of drone to use in daily life. This research paper add one more application to this list.

III. WORKING AND PARTS OF DRONES

3.1 WORKING:

First we learn how basic UAV mechanism is used. Configuration of the autonomous control system in the power line monitoring helicopter is shown in fig.1
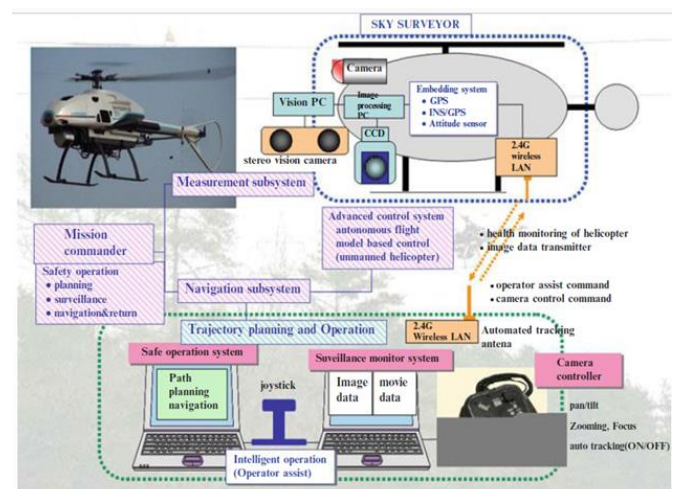

Fig 1. System overview of Sky Surveyor

Source: Daisuke Nakazawa, Farid Kendoul, Kenzo Nonami, Satoshi Suzuki, and Wei Wang.Autonomous Flying Robots: Unmanned Aerial Vehicles and Micro Aerial Vehicles.Page No.21

We can generally separate framework designs into the electrical cable checking helicopter SKY SURVEYOR which utilizes a ground station, and self-governing UAVs. The various devices used by the autonomous control system such as sensors and computer are carried in the body. The sensors used for autonomous control include a GPS receiver, attitude sensor, and compass. Flight using GPS/INS for compound inertial navigation or a three-dimensional stereo vision based method is also possible if needed. A ground station can monitor the

flight and surveillance operation, and can cancel it if needed. Concerning state of mind control, an administrator performs just position control of a helicopter with independent control, in spite of the fact that the supposed administrator helped flight can likewise be performed. In addition, although a power line surveillance image is recorded on the video camera of a UAV utilizing automatic capture mode and is simultaneously transmitted to a ground station, an operator can also interrupt and control the direction and zoom of a power line monitoring camera at any time.[**Error! Reference source not found.**]

3.2 DIFFERENT PARTS OF DRONE:

All drones parts and components are required to a smooth and safe flight. Knowing all parts give us confidence to fly drone safely. Also we can handle any issue if arrived. Knowledge about parts gives us basic idea of which part required regular inspection and upgradation.
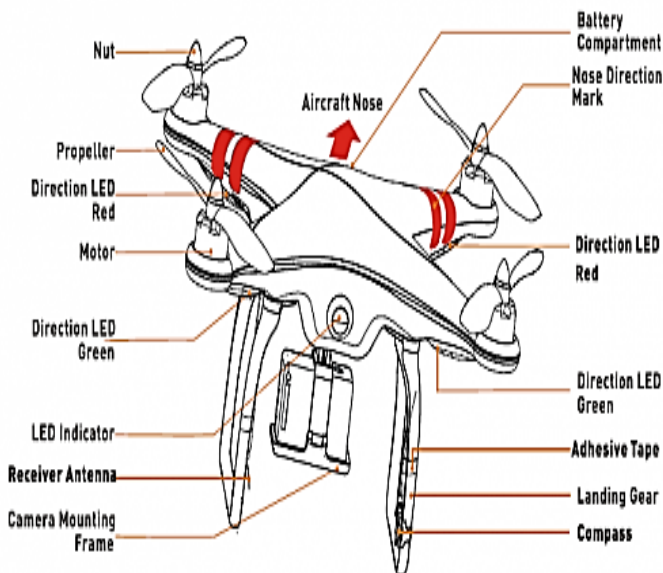

Fig 2. Parts of drone
Source: www.3dprinting.com

Here we discuss some important parts of drones.

A. Standard Prop:[[3]]

The "tractor" propeller is the props at front of the quadcopter. These props pull the UAV through the air like a tractor.

B. Pusher Prop:[[3]]

The pusher props are present at back and push the UAV forward. These moving props precisely offset engine torques amid stationary level flight. These can be made of plastic. Also, pusher props can be made from carbon fiber.

C. Brushless Motors:[[3]]

All the most recent automatons utilize a brushless motor out-sprinter type which is more productive dependable and calmer than a brushed motor. More proficient engines spare battery life and give the proprietor better flying time which is the thing that each pilot needs. A brushless dc engine (BLDC) you put the changeless magnets on the rotor and you move the electromagnets to the stator. At that point you utilize a pc associated with high-control transistors to energize the electromagnets as the pole turns.

D. Electronic Speed Controller:[[3]]

An electronic speed controller or esc is an electronic circuit with the different reason to fluctuate an electric engines speed its heading and perhaps at the same time to go about as a dynamic brake. it changes over dc battery control into 3-stage ac for driving brushless   engines. ESC offer   high   power   high recurrence high determination   3-stage ac capacity to the engines in a to a great degree conservative small package..

E. GPS (Global Positioning System):[[3]]

The GPS module regularly consolidates GPS beneficiary and magnetometer to give scope, longitude, rise, and compass heading from a solitary gadget. GPS is a vital necessity for waypoint route

and numerous different self-governing flight modes. Without GPS, drones would have exceptionally restricted employment. Drones can be used to exploring long separations and be utilized for energizing applications, for example, making 3D pictures utilizing lidar and photogrammetry sensors.

F. Receiver:[[3]]

It is a standard r/c radio recipient unit. The base number of channels required to control a quad is 4 yet 5 is generally prescribed.

G. Antenna:[[3]]

Depending on your receiver, we can choose loose wire whip or helical "rubber ducky" type.

H. Gimbal:[[3]]

The drone gimbal is the turning mount, which pivots about the x, y, and z-axis to give adjustment and pointing of cameras or different sensors.

I. Camera:[[3]]

Go Pro or other minimal superior quality video unit is utilized with on-board storage. Live streaming is possible on most of the drones for example the DJI Mavic, air, spark, Mavic pro and the phantom 4 pro.

J. Sensors:[[3]]

Drone is something beyond for elevated recording and photography. We are presently observing lidar, warm and numerous different sorts of sensors being mounted onto rambles and being utilized as a part of a wide assortment of segments. The mounted camera alongside the GPS can be utilized to make precise 3D photogrammetry pictures. By flying a mapped course and taking photographs at standard intervals, these pictures are then merge together into extraordinary 3D photogrammetry pictures.

IV. IMPLEMENTATION IN ORGANIZATION

Till Now we discuss history and how drone or UAV's works. Let's see how can drone actually implemented in organization.

4.1 For Stress Detection

Since World War II, Japan has suffered from work culture that consistent excessive overtime. To cut or stop that behavior one firm is planning to use drones that fly around the office or hover over the employee blasting Auld Lang Syne(Traditional song) to tell employees that it's time to go home.

Continue to this idea we can implement such drone in Indian organization to detect stress level, for managing working hours. In India people do overtime due to financial crises or excess work allocation. Due to this they can't maintain work-life balance.

In our country working hours for any organization is 8 to 9 hours per day, excess time worked in the organization is considered as overtime and according to Labor law every individual working more than working hours in any of the organization would be paid overtime which would be according to their day wage. This law gives support to the workers working overtime but due to this most employees work overtime and which leads to the health issues in some cases. Working long hours, even at a desk, can have serious repercussions for your physical and mental health and may even end up hurting productivity in the long run.

Now we see technical implementation of "Drone in Organization" for stress detection.

Fig 3. Basic flow chart of a system.

1. Calculate Working Hours:

In India most organization uses biometric system for check in and check out, instead of biometric we can implement system login. In system login, when employee first login to his/her own system working hours counter starts. When he/she logged out from system or closes the system counter stops this way we can calculate working hours. Additionally we can add checkers to calculate lunch or break time.

2. Drone path to find particular employee:

A server calculates working hours of a particular employee. If employees working hours are more than its predefined hours server sends signal to drone base station. Base station calculate path for particular employee and send drone to that employee. The flight controller is brain of drones which receive this

data and find best commands to send drone to particular place.

We can utilize GPS Tracker, Google gives Global Positioning System (GPS) for discovering the area of specific question or individual. A GPS module measures ramble area by estimating to what extent flag takes to move from a satellite. The fundamental element of GPS module is you can fly your drone to one way, so your automaton can fly individually from departure to landing.
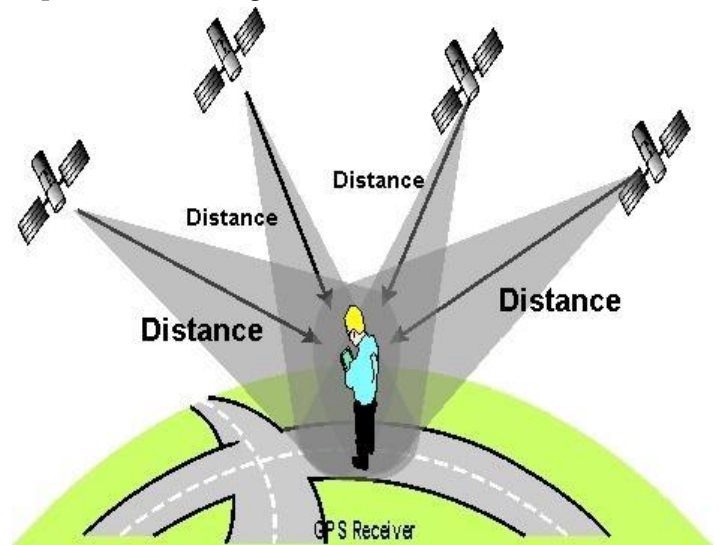

Fig. 4 GPS Working

Source: beginners guide to drone autopilots flight controllers and how they work www.dronetrest.com[[7]]

Since the GPS module needs to see the sky, it is mounted on the top of your drone. When flying on a multi-rotor most drone builders will use a GPS mast to mount the GPS module high up away from all the other electronics to ensure it gets a solid GPS signal.

Telemetry and Ground Station

Telemetry is utilized to send and get information/motion amongst drone and ground station. Adding telemetry to your automaton is exceptionally valuable, it can be discretionary.

Fig. 5 Drone gcs telemetry.Base station connected with Mobile.

Source: beginners guide to drone autopilots flight controllers and how they work www.dronetrest.com[8]
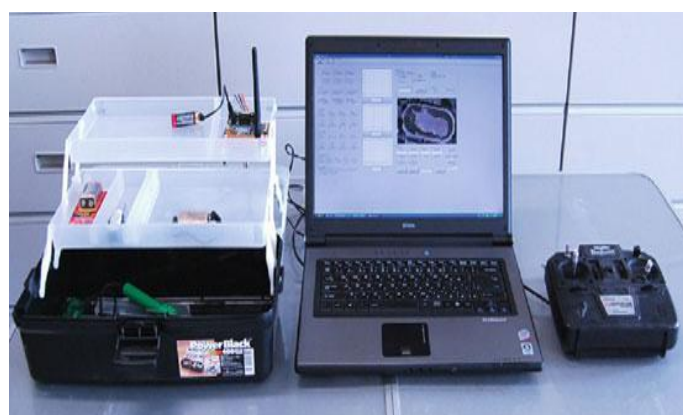

Fig 6. Photo of Ground Control Station (GCS)

Source: Daisuke Nakazawa, Farid Kendoul, Kenzo Nonami, Satoshi Suzuki, and Wei Wang.Autonomous Flying Robots: Unmanned Aerial Vehicles and Micro Aerial Vehicles. Page No.68[**Error! Reference source not found.**]

A ground station is some software or complete set up that keeps running on your PC, or tablet that you can check where your drone is flying, set new waypoints, or advise your drone to do different orders. Most drones pilots will utilize a cell phone or tablet as their ground control station.

In lower cost drones, most drone uses visual tracking to determine its position and orientation. Drones make use of GPS receivers within the navigation and control loop which gives some smart GPS drone navigation features that include:

Position Hold: Allows the drone to maintain position at a fixed altitude and location.[[8]]

Return to Home: The drone remembers the location from where it took off, and at the press of the return button, it will automatically return to starting spot.[[8]]

Autonomous Flight: The flight path of the drone can be predetermined by establishing GPS waypoints that define the trajectory. Then upon execution, the drone will use autopilot to follow this path.[[8]]

Every one of these highlights require the utilization of a GPS ramble framework, so it is vital for us to have an essential comprehension of how GPS functions.

The global positioning system (GPS) is a satellite navigation system that uses a radio receiver to collect signals from orbiting satellites to determine position, speed, and time. This route framework is more precise than different types of route and gives position learning inside a couple of meters. More advanced GPS systems can provide better accuracies within a few centimeters. The cut rate of integrated circuits has allows GPS receivers to be highly cost effective, and available to everyone. GPS is a broadcast radio system that reaches almost all over the planet, so it is highly accessible.

GPS navigation is related to the concept of "triangulation" to determine a position on the

ground. Triangulation a process where the location of a radio receiver can be determined by measuring the radial distance of the received signal from different sources.[9]

For satellite navigation, we use trilateration which requires four signals to determine the position of a GPS drone receiver. The signal from one satellite allows you to determine the radius between satellite and position of you on sphere. A second signal from another satellite is another sphere, which intersects with the first. So now you somewhere on a circle that intersects both spheres. A third signal narrows the location down to two points on the circle. To determine the proper location from these two points, a fourth signal could be used, but usually one of the two points can be rejected due to being too far from the Earth, or moving at an improbable velocity. However, a fourth measurement is usually used, but for another reason.[[8]]

When you have a GPS beneficiary, the correct separation to the three or four satellite it gets a flag from should be resolved. Each satellite transmits a coded flag that contains time stamped data with respect to its position and time. The radio wave signals are going at the speed of light. In the event that the recipient has a precise clock, it appears like it ought to be a basic instance of "Distance = time x speed".

3. Set Snooze Time:

Once the drone reach to employee one pop up appears on employee's screen saying that if you want to set snooze time or you are leaving. Employee can set snooze time for maximum one and half hour. This maximum hours divided in three parts means snooze message pop up in every thirty minutes till maximum hours completed. After completion of snooze time drone come again to notify employee to leave immediately. In most critical condition employee can stay in office for long time.

4. Find Stress Level with sensors:

The weight, model, and energy source of a drone are major factors affecting its maximum altitude, flight duration, flight range, and maximum payload, its hovering capacity. An important category of payloads are sensors.

Nowadays most drones are equipped with cameras. Cameras and microphones are the most often used sensors for drones and come standard when buying a drone. Cameras can be regular cameras or infrared. Infrared cameras have capacity of night vision and heat sensing.[[9]]

Drone provide different technologies such as camera, sensors, can provide small sound system to notify people, also record video for different purpose. When our drone reaches to employee its camera gets started and record or capture images. In some condition camera can record video of employee. All this collected data is send to base station for further calculation. Based on this data we can observe employee's body language and define stress level or any issue employee faces.

Further we can develop system which uses machine learning and artificial intelligence which accept data from different sensors and convert that data to define employee's state of mind.

5. Play Warning:

After successful calculation of stress level or employee's state of mind base station send signal to drone whether to play a warning bell or not. Once the warning bell starts ringing person where drone is hovering have to leave the office.

4.2 Employee Security:

In India employee security is most critical issue now. The term security is not limited only to male/female it's related to all human being.

- Using drone GPS tracking and camera sensors we can provide security to employee. Using GPS tracker base station can track location of employee. When employee leaves the office his/her phone's GPS gets on. Base station continuously track location of phone if any abnormal behavior observed by base station, it immediately send drone to that particular location. Once drone reaches to destination drone capture images if it founds safe drone return to base station, if situation is not found safe signal sends to nearby police station. Further we can improve this concept with new technologies.

- With the help of drone organization provide security to employee in office. There are many cases of abuse, miss behavior, harassment in offices. An hovering drone periodically checks situation in office and report such things happening in office premises. If drone found such things in premises it directly alert the security system.

V. CONCLUSION

Drones are small aerial vehicles, easy to use if anyone get proper training. Proposed system has many advantages over current methodology. Organization can track employee's mental balance when he/she is working in office. Also organization can help employee to maintain his/her work-life balance. Organization can provide better environment to employee. He/She feel more secure when they work in organization.

VI. FUTURE SCOPE OF RESEARCH

The current research is limited to basic working and manufacturing as discussed working section. In future more depth research would be conducted on this. Currently used technology is limited we can add

more advanced functionalities. In present system most activities required human involvement, further research would be conducted to automate the complete process and reduce human involvement to get accurate data and usage.

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