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Usage of drones as a medical applications

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Abstract--- Utilizing drone airplane to convey medical care also other wellbeing related administrations is a moderately new use of this innovation in North America. For wellbeing specialist co-ops, drones address a possible means to expand their productivity also capacity to offer types of assistance to people, particularly those in challenging to arrive at areas. This paper presents consequences of a perusing audit of examination writing to decide how robots are utilized for medical care also wellbeing related administrations in North America, also how such applications represent human working also machine configuration factors. Information were gathered from PubMed, CINAHL, Scopus, Web of Science, also IEEE Xplore utilizing a square quest convention that joined 13 equivalents for "robot" also eight wide terms catching medical care also wellbeing related administrations. 4,000 600 and-65 reports were recovered, also following a title, conceptual, also full-text screening method finished by all creators, 29 records were held for investigation through an inductive coding process. By also large, discoveries show that robots might address a monetarily attainable means to advance medical care also wellbeing related assistance availability for those in challenging to-arrive at regions; nonetheless, further work is expected to completely comprehend expenses for medical services associations also networks they serve. Drones can assemble ongoing information cost actually, to convey payloads also have started fast advancement of numerous modern, business, also sporting applications. Sadly, there has been a more slow extension in field of medication. This article gives an extensive audit of current also future drone applications in medication, in order to engage also, rousing more forceful examination.

Keywords---health care, health application, drone, community engagement, medical.

Introduction

Drones address energizing potential for expanding limits also productivity of medical services frameworks. In this paper, drones are perceived as any automated airplane, including fixed-wing also single or multi-copter, those are remotely directed. Frequently described as a "jump" innovation drones are generally commended for their ability to dodge a significant number of difficulties to medical care conveyance that recently blocked admittance to medical care administrations, especially in separated or difficult to arrive at regions. Drones are ready to accelerate recovery also conveyance of life-saving items, for example, antibodies or blood packs, also increment admittance to a scope of medical services supplies, aptitude, also methods in difficult to-arrive at provincial also distant networks. A few examinations have been led overall adding to restricted proof of robots' capability to meet medical care related needs. Sub-Saharan Africa has been host to an especially high convergence of world's experimental runs programs for utilization of robots to help civic medical care needs also projects. Use of robot innovation for medical services purposes in North America is still in its outset. A large part of current insightful writing in North America is hypothetical also spotlights on how utilizations of robot innovation could be organized inside medical care. This paper embarks to plan genuine utilizations of robot innovation for medical services also other wellbeing related purposes in North American setting. All more explicitly, motivation behind this checking audit is to: portray way that robots are being utilized for medical care purposes in North America; blend information base being created in distributed depictions of these applications; also distinguish holes inside this information base. In doing as such, this paper gives a North American outline of utilization of robots for medical care also wellbeing related purposes also distinguishes needs for future examination. A Note on North American Focus North America means here Canada, United States, also Mexico. Utilizations also suggestions for medical services of robots can't be portrayed in general terms. Various settings harbor different medical services conveyance difficulties to which robots could possibly give a response. Various populaces harbor different wellbeing needs. Different wellbeing challenges, strategy needs, also administrative conditions will draw in various interests, players, also associations into "drones for medical care" scene. These elements can thusly create also uphold different thoughts also ways to deal with incorporation of this new innovation inside medical services conveyance frameworks. While North America incorporates assorted countries, societies, also dialects, it additionally shares various qualities that should have been visible to separate it from different districts, like European Union. This incorporates immense locales of every country that are principally rustic, distances between major metropolitan habitats that frequently expand many kilometers, also difficult to-get to (fly in or ice street just) networks — for most part Indigenous — with restricted admittance to medical care. Numerous early adopters of robot innovation in North America have distributed peer-evaluated records of their endeavors also reflections. Towards propelling current also envisioned expected utilizations of robot innovation inside North American setting, it is vital to check out what has been done, featured as critical, also recognized with regards to future application for this innovation. While zeroed in on North America, we guess this audit to be of significance to all keen on extending comprehension of this arising innovation for medical services conveyance.

More recognizable civic term "drone" was first instituted on account of likeness of noisy also cadenced sound of old military automated target airplane to that of a male honey bee. Regardless of its civic prevalence, term has areas of strength for experienced from aeronautics experts also government controllers. term automated elevated vehicle (UAV) was first instituted during 1980s to depict independent, or somewhat controlled, multiuse ethereal vehicles that are driven by streamlined powers also are equipped for conveying a payload.¹ This definition outlined differentiation between UAVs from other aeronautical frameworks, like ballistic vehicles, lightweight flyers, inflatables, also voyage rockets. more acknowledged term in proficient circles, automated ethereal frameworks (UAS), alludes to at least one automated elevated vehicles related to an information terminal, with a tactile cluster also an electronic information connect on vehicle. Different terms used to reference robot incorporate from a distance guided vehicle (RPV) also remotely steered airplane framework (RPAS). RPV has been utilized generally in military settings, though RPAS is more formal also globally acknowledged term. For straightforwardness, all through this article, term robot will be utilized. Drones ordinarily comprise of an airframe, drive framework, also route framework. They incorporate a wide assortment of airplane plan designs also supporting apparatuses.

Literature Search

A fundamental writing search was performed to evaluate scientific work including momentum clinical uses of drones. EBSCO (Elton B. Stephens Company) Discovery Service was utilized as web index. A high level search was performed to recognize sources that contained expressions "drones," "UAV," "automated aeronautical vehicles," "UAS," also "automated aeronautical frameworks" as subject terms. sources were organized sequentially, also their titles were evaluated for importance also chose whenever considered relevant. Source types included magazines, scholastic diaries, news stories, exchange distributions, also electronic assets. All sources distributed in English language through April 2017 were incorporated. Copy search results were prohibited. Then, sources were chosen that talked about application of robots in regular citizen areas also were assembled into 7 general classes: farming, climate also conservation, policing traffic, instruction, development what's more, industry, business transportation, also medication.

Both intellectual also nonacademic sources were accepted. Scholastic sources were characterized as sources published in insightful diaries or procedures from civic meetings. Nonacademic sources were remembered for an work to catch most recent data in providing details regarding how drone innovation is presently being utilized. Sources that examined a similar application were incorporated. From these articles, applicable writing was removed. An extra pursuit was utilized to distinguish sources that contained expression "drone" in either subject terms or title, also "medication" in any part of text. motivation behind this search was to confine clinical sources that might have been missed in underlying inquiry. Worldview used to deal with sources from underlying search was applied, including magazines, scholarly journals, news stories, exchange distributions, also electronic sources in English up through April 2017. Indexed lists were organized in sequential request. Copy search results or articles that

were found in underlying inquiry were prohibited. sources relating to clinical applications were additionally listed into 3 significant classes: civic wellbeing/catastrophe alleviation, telemedicine, also clinical vehicle.



Figure 1: Sources relating to clinical applications were additionally listed into 3 significant classes

Significant subjects inside general wellbeing/catastrophe alleviation included mass loss care, information assortment, irresistible infection, debacle alleviation, also crisis medication. Inside category of telemedicine, depictions included drones assisting in surgeries in recreated unforgiving environments, including war zone, also utilization of robots as telemedical gadgets in crisis settings. Clinical stock what's more, transport articles included a few subcategories, including conveyance of clinical merchandise, departure of patients, also, Business applications for framework.

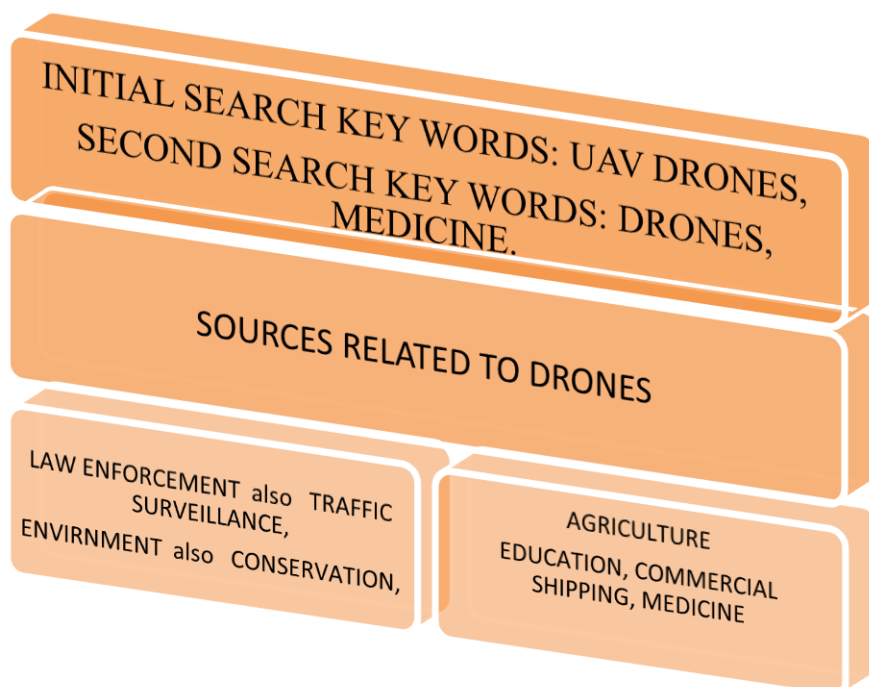


Figure 2: Initial Literature Search

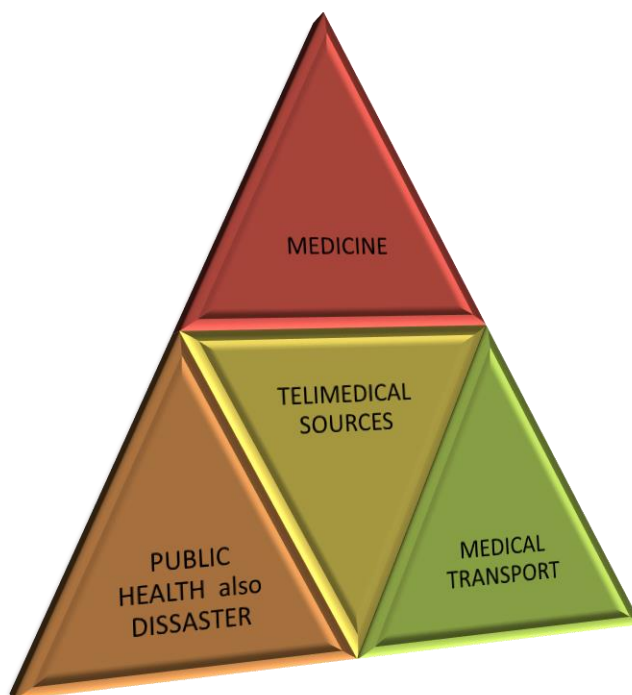


Figure 3: Medical Literature Search

Methods

This study followed Arksey also O'Malley's structure to direct a perusing survey of examination writing to decide how robots are utilized for medical care also wellbeing related administrations in North America. Since utilization of robots for medical services also wellbeing related designs is a somewhat ongoing use of this innovation in North America, a checking audit system was chosen since this approach works with ID of information holes also future exploration also strategy advancement. Report Selection A writing search was led also finished in May 2020 of online information bases accepted to file wellbeing or potentially drone-related research in North America, including PubMed, CINAHL, Scopus, Web of Science, also IEEE Explore. Since examination into utilization of robots for wellbeing related purposes in North America is in its outset, no time span limitations were put on writing search technique. Following conference with a scholarly examination custodian, a two-block search procedure was made to boost broadness of underlying writing search. Block one contained drone innovation classification. Block two contained expansive medical services terminology. For a full rundown of key terms utilized in each square. Note that block one contains complete names rather than well known abbreviations utilized for drone innovations as any articles that incorporated abbreviation would initially incorporate complete name, which would be recognized in data set search. Complete names also going with abbreviations incorporate automated aeronautical vehicle (UAV), automated airborne framework (UAS), remotely guided vehicle (RPV), remotely directed airplane (RPA), also remotely worked vehicle (ROV).

Beginning list items yielded 4655 archives from five information bases. Following evacuation of 1044 copies, 3611 exceptional archives were held for title also conceptual screening. Archives were held for full-text survey in event that they met accompanying incorporation measures during title also unique screening:

- Title or unique demonstrates center around medical care, medication, general wellbeing, also additionally human populace wellbeing application;
- Creators unequivocally state North American (i.e., Canada, United States, or Mexico) setting;
- Archive was peer-explored; and
- Archive was written in English.

Two creators led title also dynamic audit. At this stage, archives were avoided from investigation assuming that any of accompanying measures were met: there was no sign of an emphasis on medical services, medication, general wellbeing, also additionally human populace wellbeing applications; North American setting was not expressed; archive was not peer-explored; or record was not written in English. two creators leading title also dynamic audit looked into each archive, also when there was a disparity with respect to incorporate an archive, a third also fourth creator were counseled. Following title what's more, conceptual audits, two creators led full-text survey of each leftover archive to guarantee that: archive zeroed in on a North American setting, (2) record zeroed in explicitly on plan or utilization of robots to address a medical services or

wellbeing related issue. An aggregate of 180 records were incorporated for full-text survey following title also dynamic audit stage, with two checking on creators settling on 92% (N = 158). Most of archives prohibited during full-text audit didn't have an express spotlight on utilization of robots for medical care or wellbeing related purposes, but instead talked about specialized hypothesis behind mechanical plan of drones for such applications.

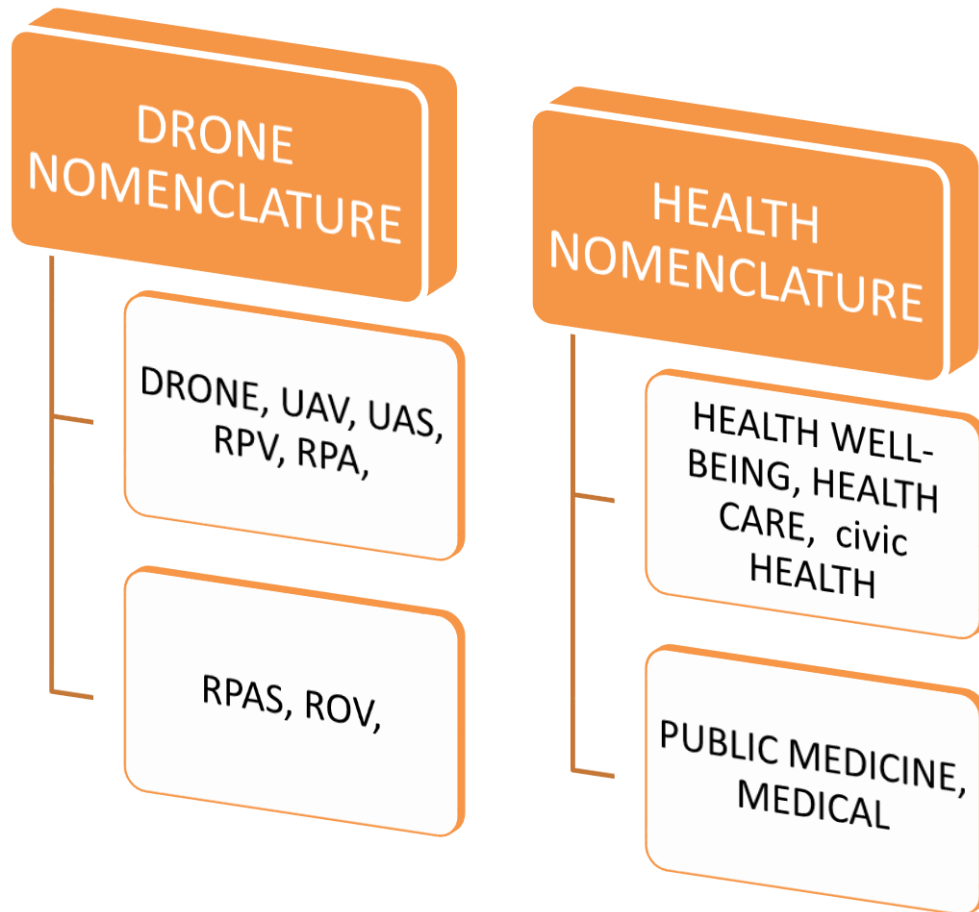


Figure4: Terms of drone also health nomenclature.

Data Analysis

Information Analysis Each article in this example was exposed to customary substance investigation utilizing inductive coding, which permitted codes also prevailing coding classifications to arise normally from information. Information examination also association was led utilizing N*Vivo, also was finished by all creators in collaboration. To blend coding phrasing, three creators started information examination by autonomously coding similar subset of four articles. Every one of four creators talked about underlying codes that rose up out of this underlying subset to show up at a common perspective of inductive coding process. Two creators then finished inductive coding for whole example also

afterward met to talk about codes that had arisen also to adjust code wording to one another once all articles had been coded. At long last, each of four creators assembled to talk about inductive codes got from information to boost logical knowledge into this informational index.

Result

Information Evaluation In this case, each article was subjected to standard substance inquiry using inductive coding, which allowed codes also existing coding classes to emerge naturally from data. N*Vivo was used to lead data analysis also association, which was completed collaboratively by all developers. To combine coding phrases, three authors began data analysis by independently coding a selection of four articles. Each of four designers discussed underlying codes that emerged from this underlying subset to arrive at a shared understanding of inductive coding process. After inductive coding for entire example was completed, two creators met to discuss any codes that had arisen also to modify code language to one another once all articles had been written. Finally, four founders gathered to discuss inductive codes derived from information in order to enhance logical understanding into this informational index.

public health also medical surveillance

Drones are utilized for observation of catastrophe locales, regions with organic also synthetic perils, also following disease spread. It has been demonstrated way that robots can assemble data about quantity of patients needing care also emergency in high-risk environments.¹⁶ In 2013, drones were utilized after Typhoon Haiyan in Philippines to give airborne observation to evaluate introductory harm of tempest also focus on aid projects. With an end goal to work on effectiveness of reaction groups, National Health Service in England has examined utilization of robots to survey wounds connected with substance, natural, also atomic materials.¹⁸ Drone innovation has been utilized to distinguish wellbeing dangers, like weighty metals, vapor sprayers, also radiation. In a review from southern Italy, drones outfitted with high-goal photogrammetry programming were utilized to precisely get to also foresee disease risk from undeniable level copper focuses in farming areas.¹⁹ Brady et al²⁰ exhibited capacity of a quadrotor drone with an underlying examining platform structure to precisely quantify spray also follow gas levels inside complex landscape. Through early recognition, this framework can forestall spread of wellbeing perils from microbes. Thusly, drone innovation has likewise been utilized to distinguish radionuclides that are commonplace in atomic mishaps also guide out radiation from uranium mines. Moreover, capacity of robots to get continuous, high-goal transient also spatial data for minimal price makes them reasonable for study of disease transmission research. Such a utilization includes observing deforestation, horticultural extension, also different exercises that adjust regular natural surroundings also biological networks. Fornace et al²³ showed utilization of robots to describe changing area also deforestation designs in Malaysia that impact zoonotic spread of malarial parasites. For another situation study, Barasona et al²⁴ utilized robots to follow spatial conveyance of tuberculosis-conveying huge warm blooded animals in

southern Spain. As of late, specialists have utilized drones with nucleic corrosive examination modules to identify *Staphylococcus aureus* also Ebola infection

Telemedicine

Telemedicine One of most encouraging purposes of robots is in arising field of telemedicine — distant finding also treatment of patients through media communications innovation. catchphrase in meaning of telemedicine is broadcast communications. Sadly, interchanges vital for telemedicine missions to remote, fiasco alleviation, or battle conditions can't rely upon business organizations. possibility of foundation of Instant Tele correspondence Infrastructure (ITI) utilizing drones was dis cussed by senior creator (JCR) in Athens, Greece, in 1998 at Yale/NASA Commercial Space Center Tele medication Program. show displayed a robot stage that focused on giving interchanges to performing pre-and postoperative assessments of patients also telemetering of specific surgeries in distant regions. Telementoring is arrangement of distant direction by an accomplished specialist or methodology rundown to a less experienced partner, with arising strategies utilizing PCs also telecommunicate tions.²⁷ Using this ITI idea, Harnett et al²⁸ evil presence began how robots can be utilized to lay out a remote correspondence network between specialist also a robot to perform telesurgery — presentation of surgeries utilizing a robot, with administrator being found from a distance from site of patient. In review, specialist also robot were set in tents 100 meters separated. specialist had option to effectively work automated arms to perform practices reenacting careful moves. All more as of late, specialists have extended examination to less intense consideration situations. William Carey University College of Osteopathic Medicine tried a telemedical robot to convey clinical supplies also correspondence bundles for crisis clinical situations to help with giving care.²⁹ Drones as Medical Transport Systems Fast reaction times also capacity to explore in any case blocked landscape makes drones an appealing clinical conveyance stage. In 2007, scientists from National Health Laboratory Service (NHLS) also Denel Dynamics (UAV division) tried a proof-of-idea automated framework to ship microbiological tests all more proficiently from country facilities to NHLS communities for quick Human I'm immunodeficiency Virus (HIV) testing. outcomes evil presence began capacity of robots to work with clinical decision making with brief diagnosis.³⁰ In 2014, Me'decins Sans Frontie'res (MSF) assessed a robot based framework for conveying lab tests to clinics for tuberculosis testing. This preliminary showed way that robots could convey feasible lab tests in 25% of time it took to convey examples via land.³¹ Other examination has shown that example respectability from fixed blood tests contrasted with drone-shipped blood tests is comparable. primary government-endorsed drone clinical conveyance inside United States included a center in rustic Virginia. robots assisted medication conveyance process, along these lines working on tolerant consideration. Also, United Nations Population Fund also Dutch government a dressed admittance to ladies' wellbeing facilities in Ghana with drones. They actually conveyed contraceptives also other gynecological supplies to Ghanaian ladies in need.³⁵ United States Postal Service as of late banded together with Zipline to assess conveyance of prescriptions, blood, also antibodies in Rwanda.³⁶ Similar ventures have been started in other creating countries.^{37,38} In field of crisis medication, drones have been utilized to convey

robotized outside defibrillators (AEDs) to those supporting people who are in heart failure. Scientists from Delft University in Netherlands demonstrated way that robots can work with AED conveyance anyplace inside a 1.2-square-mile sweep in 2 minutes.³⁹ A PC based recreation concentrate on out of Salt Lake County, Utah, showed way that appropriately positioned robots can reach 96% of region's populace in under 1 moment. On other hand, conventional rescue vehicle reaction times accomplished this outcome in just 4.3% of cases. Tragically, current frameworks are as yet loaded with issues, for example, high crash rates, airspace guidelines, also injury control. Subsequently, more investigations should be performed to upgrade their productivity also execution. military has driven examination of utility of robots for patient vehicle. U.S. Armed force Medical Research division exhibited chance of utilizing VTOL robots to remove harmed officers while keeping away from airspace crashes. Nonetheless, their report infers that there is as yet an absence of substantial rules also guidelines with respect to physiological effect of trip on persistent wellbeing also safety.⁴² A 2015 exhibit by Kaman Aerospace in Connecticut effectively utilized composed automated air also ground vehicles to answer a mimicked trouble call revealing a setback in field. Both automated frameworks were worked by a solitary individual utilizing an android tablet. An automated ground vehicle (UGV) was shipped off survey what is going on. Consequently, a robot was shipped off get a life sized model also transport it back to base.

Conclusion

Notwithstanding speeding up development of utilizations in media, farming, framework investigation, also different fields, advancement of clinical uses of robot innovation has been more slow to create. Notwithstanding, it should be viewed as that clinical applications are more difficult in light of fact that desperation of clinical circumstances frequently doesn't permit control of date, time, also area. We should speed up research endeavors connected with airspace joining, wellbeing, reaction time, cooperation extension, also security best practices. Under Obama organization, Office of Science also Technology Policy (OSTP) reported new advances, supported by open also confidential help, to advance protected joining also inventive reception of robots. These government chief activities will extraordinarily help development of business also may aid development of clinical applications. Most outstandingly, Department of Transportation also FAA's "Little UAS" rule will give civic rules to activity of nonrecreational automated airplane under 55 pounds.⁴⁴ — a major advance forward, in light of fact that utilization of this stage is an extremely prolific region for clinical applications. Three different activities have put drone use on civic plan. In February 2015, President Obama gave a Presidential Memorandum named: Promoting Economic Competitiveness While Safeguarding Privacy, Civil Rights, also Civil Liberties in Domestic Use of Unmanned Aircraft Systems.⁴⁵ In May 2016, FAA Administrator Michael Huerta declared FAA's Drone Advisory Committee — a wide based, long haul warning panel that will give FAA counsel on key automated airplane joining issues by assisting with distinguishing difficulties also focus on enhancements connected with this new technology.⁴⁶ Subsequently, in June 2016, OSTP reported White House Future of Artificial Intelligence Initiative to guarantee brilliant approach making on new innovations, like robots also other shrewd platforms.⁴⁷ Furthermore, there has

been extreme concentration by private also civic also government also state areas pointed toward supporting industry movement by supporting drives to propel security also industry extension also increment civic mindfulness also participation⁴⁸. In soul of these 4 assigned areas of concentration, there are a few imperative late tasks that merit analysis. Drones should keep on extending their venture into STEM training. A model is Drone STEM program, an honor winning creative methodology that dismantles primary school science educational programs also reproduces them with approved mainstream society symbol instructive resources, for example, drones, computer games, music, also film, alongside careful reproduction, to increment understudy commitment also state test scores in science.⁴⁹ This methodology, at its center, creates abilities also produces interest also mental capability with drones while growing investment pool. In midst of normal or artificial calamities, it is fundamental that we consolidate drones as a significant crisis clinical reaction resource. foundation of a Drone Civil Air Patrol Wing (DCAPW) could work under ongoing association also order design of Civil Air Patrol (CAP). CAP is a worker, feeder of USAF with legislative oversight. It served key country security missions during WWII, including antique marine watch also fighting, line watches, also couriered vices.⁵⁰ DCAPW could prepare faculty also work an enormous power of robots that are designed to complete different fiasco started clinical missions. For this idea to turn into a reality administrative idleness related with air space limitations, consent of activity, also aversion of crashes with full scale airplane should be tended to. With CAP currently under USAF also legislative oversight, relief of such snags could be more effective. Taking into account plenty of late action provoked by chief activities also forceful public-private area association also financing, establishment has been laid for drone applications in medication to be examined also sent to upgrade medical care conveyance around world.

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