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# DEPLOYEMENT OF AI POWERED DRONES FOR CITY SURVELIANCE AND MONITORING

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**Abstract -** *Drones are unmanned aerial vehicles that are remotely controlled. They range in size from under one pound to several hundred pounds (Perlman 2016). This thesis addresses drones classified for consumer use, which the Federal Aviation Administration (FAA) defines as drones between 0.55 to 55 lbs. (FAA 2016e). Since consumer drones have been available for purchase in greater numbers than ever before, legislation related to no-fly zones needs to be centrally organized (Perlman 2016). This can be done through the creation of a geodatabase and web-GIS map, which will allow for visualization of drone use areas. The study area for this thesis is the state of Maryland, which was chosen because it contains every type of FAA no-fly zone and has not passed any drone use sub-national rules; this allows for the current FAA regulations to be studied and improvements recommended where necessary.*

***Key Words***: **Drone, GPS, Arduino, Gyro, Frame, Propeller, Autonomous.**

## 1.INTRODUCTION

Drones have been become one of the hottest tech toys in recent years, but what are these flying machines and what are they capable of ?Drone is the common name for an unmanned aerial vehicle, or UAV for short. UAVs are vehicles that do not carry humans inside of them. They can be controlled by either a human or by a computer. UAVs were originally used in the military to carry out tasks that were either too difficult or too dangerous for humans to perform. Some other military applications include drone surveillance and drone attacks. Civilian UAVs have become more and more popular. Some recreational drone activities include photography, and racing. UAVs have also been used to smuggle drugs and other types of contraband. Many companies are now pushing for drone delivery services. There are 4 major types of drones which have different characteristics to cater to different need.

### 1.1 Multi Rotor Drone

Multi rotor drones are most commonly used for photography and videography. The can be further classified by the number of rotors: tricopters have three rotors, quadcopters, have four and hexacopter and octocopter have 6 and 8 rotors respectively. Multi rotor drones typically have a limited flying time of only 20 to 30 minutes because most of the drone's energy is used to power each rotor to help it stay balanced. Thus, energy efficiency increases as the number of rotors decrease. Multi rotor drones are beginner friendly because they require minimal skill and are usually the cheapest and easiest to manufacture. Multi rotor drones can only operate on electric motors due to their fast and high precision throttle changes that gas engines have difficulty supporting.

### 1.2 Fixed Wing Drone

Fixed wing drones have wings instead of rotors to provide lift. Because of this, they only need energy to propel them forward and are more energy efficient than multi rotor drones. Gas engines can be used to power fixed wing drones which can allow them to fly for longer periods of time. Despite these pros, fixed wing drones are not equipped to carry cameras so they can not be used for photography; they also require more skill to successfully launch and land. The average pricing of fixed wing drones (on average, ranging from a couple hundred dollars to tens of thousands of dollars) tends to be higher than that of multi rotor drones (on average, ranging from as low as $30 to a couple thousand dollars) , so the required skills and pricing make fixed wing drones less accessible to beginner drone fliers.

### 1.3 Single Rotor Helicopter

Despite its name, single rotor helicopters actually have 2 rotors. There is one large rotor at the top of the helicopter for lift and one small rotor at the back for controlling direction. Since single rotor drones have fewer rotors than multi rotor drones, they are also more efficient. Special training is required for users because the top rotor's large blades create a risk for fatal injuries.

### 1.4 Fixed Wing Hybrid VTOL

UAVs that have any combination of characteristics from different UAV types are considered fixed wing hybrid VTOL drones. Fixed wing hybrid VTOL drones are not widely available because there hasn't been a focus to develop any particular type of hybrid VTOL drone; however, they are slowly gaining in popularity. Some noteworthy types of hybrid VTOL drones include the tail sitter drone, which looks like fixed wing drone with its nose facing upwards and rotors on its sides in order to lift itself.

## 2. LITERATURE SURVEY

The beginning of the development of remote controlled devices started with the invention of the radio, back in the 1880's, when Nikola Tesla invented the induction coil, a necessary device to send and receive radio waves. At first, these radio signals were intended for communications purposes, but during World War I the Germans started using remote control stations for manipulating tanks loaded with explosives. Between 1914 and 1918, the development of various radio controlled unmanned aircraft were intended to be used for military purposes; however none of the prototypes was fully functional to be used during the war. This also marked the beginning of the use of radio waves for commanding machines and computers, such as power plants and satellites.

After the increasing development in computer technologies in the 1940's, the use of UAVs had opened new frontiers, mostly military purposes for reconnaissance missions and also pilot trainings, but their civilian applications were moving slowly along with research. One clear example is the incorporation of GPS technologies. Since World War II, the preliminary research into general relativity led to the base for our actual GPS technologies, this was called ground-based radio-navigation systems. Although, it was not until the 1990's that the US began incorporating this technology into the UAVs of that period.

## 3. REGULATIONS

Similar to what has happened with incorporating new technologies into our lives, UAVs are part of ethics discussions and companies that hold the technologies to create such flying devices, and their components, are waiting to start profiting from the results.

So far, the use of UAVs in the civilian sector is mainly for surveillance purposes, which is one of the functions of drones, for military purposes, but there are no limits for what they can be useful in research and governmental purposes. To name a few, Vertical Profiles of Shortwave Atmospheric Heating Rates, Imaging Spectroscopy,Topographic Mapping; and non-research, Coastal Patrol, Forest Fire Damage Assessment, Forest Fire Mapping, Invasive Plant Assessment. Most of these applications are in early developments and there is lack of regulations and specifications for starting with new projects.

These regulations concern the following:

- Lack of airspace regulation that covers all types of UAV systems (encompassing 'sense and avoid')
- Affordability - price and customization issues
- Efforts to establish joint customer requirements
- Liability for civil operation

The lack of precise regulations has not stopped the enthusiasm of individuals and known universities, to create or modify existing UAVs into what could possibly be helpful in the future. The Swiss Federal Institute of Technology Zurich has a department focused only in the development of intelligent aircraft

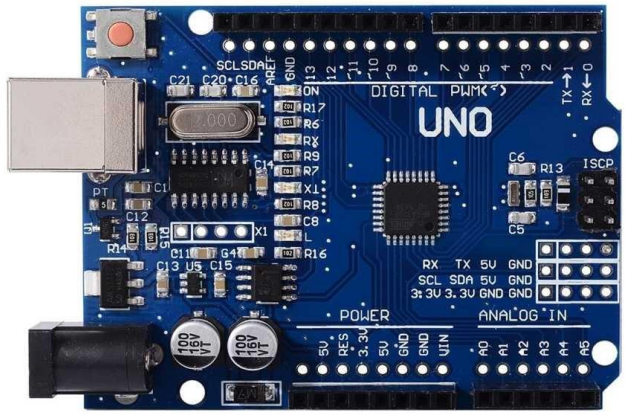


**Fig -1**: Arduino UNO

**4. FLIGHT PLATFORM**

At the start of the spring, our team began to build the Drone. We started by researching many different types of Drone platforms and looking at current frames in use but we used the 3d printed plastic. With the frame, we also got the motors and propellers. These components determined how much room I had for the electronics as well as how much weight I could put on the helicopter and still have lift.

The next thing we chose was the microcontroller which was an flight controller board. This board included all of the major sensors that we would need to achieve flight. Finally we purchased a Lithium-ion polymer (Li-po) battery because they have the best ratio of weight to power. The particular battery we chose has been sufficient to complete the design, assembly, and testing of the Drone systems and our experiments have shown that since we have plenty of thrust we can chose a larger battery for our mission flights to improve the flight time.

We also had to provide a way to control the Drone from the ground. We decided to use an RC controller which is displayed in Figure (4.2.b) below. We bought the Fly sky fsi6 series which has 6 channels and runs at 2.4 GHz. Currently we are using 6 channels for up/down movement, pivot, left/right, and finally forward/backwards. We also can program the other two channels to perform functions such as altitude hold, a take-off command or control the payload.

**3. CONCLUSIONS**

It is obvious that drone technology is an important part of the future of warfare and is set to become a big commercial industry. The fact that drones capabilities pose a threat to the liberties of people around the globe is also apparent. Legislating on drones now is of paramount importance because it sets the necessary limitations to protect rights as drones are used in the future.

Limitations must be put in place as to where the line between effective drone use and excessive drone use is. Drones have the potential to become a vital part of society, but they also come with a lot of disadvantages. For every successful drone strike on foreign soil, many more innocents are killed. For every person who seeks to help the United States with drones, there is a person who seeks to hurt it. Acknowledging that drone technology is not flawless is the integral idea, and as such Americans must demand constraints under which drones are used.

This will be difficult due to the novelty of drone technology. Because the technology is so cutting-edge, it is hard for lawmakers to know where to curb its use. The inability and unwillingness of the government to regulate drone use stems from both its success in warfare and its growing necessity in other fields.To overcome this confusion everyone must be more educated on the use and potential of drones. There is a need for transparency on drone use in warfare, so that citizens may be better informed on the consequences of the technology. The laws that are in place protecting Americans from domestic drone pilots are not enforced well enough. A registration system for drones would make drone-users more accountable for their actions such as flying them near airports. Internationally, the United States should be aware that with every drone used, a precedent is being set. As more and more countries develop drone technology, the threat of foreign drone fly-overs becomes imminent. An evaluation of America's drone policy is imperative to move forward.

An ideal policy for the use of drones would include more transparency, international standardization and cooperation, and a system to keep track of who owns drones domestically. More transparency could be derived from a requirement that any drone strike on foreign soil be reported along with all of the casualties, not just the targets. To achieve international standardization and cooperation, the United Nations should be involved. While the United States is currently the leading drone using nation, other countries are not far behind. If there are no international laws limiting this specific technology, it

could lead to increased international tension similar to that of the Cold War. Domestically, the idea of unknown drones having the ability to fly anywhere and take pictures of anyone does not correlate with liberty or security. A system similar to the registration of firearms would check drone use and hold the pilots liable for their actions.

These suggestions are not without flaws. The problem with more transparency would be that American strategies would be more open to its enemies; however, in the long run this would work to the advantage of the United States because other nations would be more transparent in return. Getting other nations to relinquish control of their drone programs in order to comply with the standards of the United Nations would take a lot of diplomacy, but if tensions like those stemming from nuclear weapons can be avoided, all nations will benefit. Having to register drones would be a big cost to the American government and ultimately the American people through taxes. When this cost is put into context where drones threaten both the liberty and security of citizens in the air and on the ground, the cost should be negligible.

Drones have become necessary to the security of the American people. With the proper limitations they can become a useful tool without infringing on the principles that the nation was built upon or the rights of citizens of foreign nations. Deciding where drones fit in is no easy task, but the time to regulate their use is fast approaching as the industry grows and develops.

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