Geog 270 Research Project
Drone Applications for Water Quality Monitoring
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Abstract

This research project is an in-depth look at the applications of drones for water quality monitoring and remediation. For years, humans have known about the importance of maintaining the quality of their water for drinking, bathing, washing, and whatever else they may need to utilize the water for. This is because disease can run rampant when water quality integrity is compromised. For this reason, methods of monitoring water bodies to ensure the cleanliness of their water supplies became commonplace throughout most modern countries; however, with the recent explosion in drone usage, it has come to the attention of most water quality scientists that the possibilities of using drones to monitor water quality are nearly limitless. This project will explore these possibilities and determine their viability for the many different situations that may be encountered while in the field.

Introduction

Human history is dotted with disease outbreaks resulting from inadequate water quality. It is something that was always known more or less but not much could be done about it and as a result, waterborne illness became a part of everyday life. It was not until recently that the issue was taken seriously, and measures were put in place to mitigate the risks of waterborne illness and other potential hazards that can be found in water such as radiation or dangerous toxic metals. Maintaining clean water is such a big deal that it was even set forth as one of the 17 sustainable development goals by the United Nations. Despite this, millions of people around the globe struggle daily to access clean water and even in first-world countries, the presence of potentially toxic substances from all sorts of origins is an ever-present danger. For this reason, methods have been created to sample water quality and determine whether or not the water is safe for immersion or even consumption in some cases. The rapid advancement of drone technology has opened a whole new world of possibilities for gathering the necessary data to make informed decisions regarding water quality and provide an avenue for streamlining the water quality process.

Method

For my research project, I utilized numerous different sources to determine the extent of drone usage in this field of environmental science. By figuring out exactly what the current capabilities of the currently available technology are, I will be able to formulate ideas for possible future applications of the technology. This information will be vital in determining how realistic some possibilities are as well as their feasibility. Many things could derail drone use in water quality monitoring such as lack of funding, lack of feasibility, or there could simply not be enough people who are legally registered to fly a drone just to name a few but to modernize water quality sampling, these difficulties must be overcome, and this project aims to explore some of the possible applications.

Results

In my research, I came across numerous fantastic ideas regarding drones in the field of water quality monitoring. Perhaps the most interesting was a project by the Great Lakes Drone Company which sought to reduce the time needed to gather water quality samples by 75%. This

would be done by replacing most of the human aspects of water sampling with autonomous drones which could collect samples and provide data for management. This struck me as a particularly great idea because it frees up time for those gathering the data to be able to allocate time and attention towards other important roles and projects. Additionally, if drones can be used to gather water samples much quicker, then the samples can be obtained more frequently which allows for more accurate and up-to-date results. Another very interesting drone project for obtaining water samples is a device called nixie which carries two EPA-approved sampling bottles and can be attached to a drone. This drone is then flown near the surface of the water where a sample is trying to be collected and dipped into the water. This allows for samples to be taken in places where they might not otherwise be able to be collected for one reason or another such as the water being inaccessible or the sample being too time-consuming to collect. Ultimately, it is projects like this that will greatly enhance the abilities of environmental scientists or any other people with a vested interest in keeping the environment healthy. I think there is a lot of potential to utilize drone processes such as the ones listed here to expedite the time it takes to gather water samples and ensure more consistency between each of the samples so that things like bias can be eliminated.

Conclusion

Overall, I found it very interesting to learn about the many different ways drones can be used in the world of water sampling. I work for the South Dakota Department of Agriculture as an environmental scientist in the Surface Water Quality program and I can see a lot of potential in the drone applications listed in this research paper. I fully intend on obtaining my drone license and putting it to use to help speed up our sampling methods and provide more insightful data to the lab than there is currently. For example, I think the ability to see down on a creek or river from up high would be a great thing to keep tabs on since they can shift so much with floods and other geographically altering events and having an understanding of how the waterway has shifted over the years could provide a lot of invaluable information for understanding unexpected changes in the water quality of that particular body of water. Going into the future, technology is only going to increase and the capabilities of things like drones are going to increase accordingly and this is of the utmost importance since human health is at the pinnacle of our society.

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