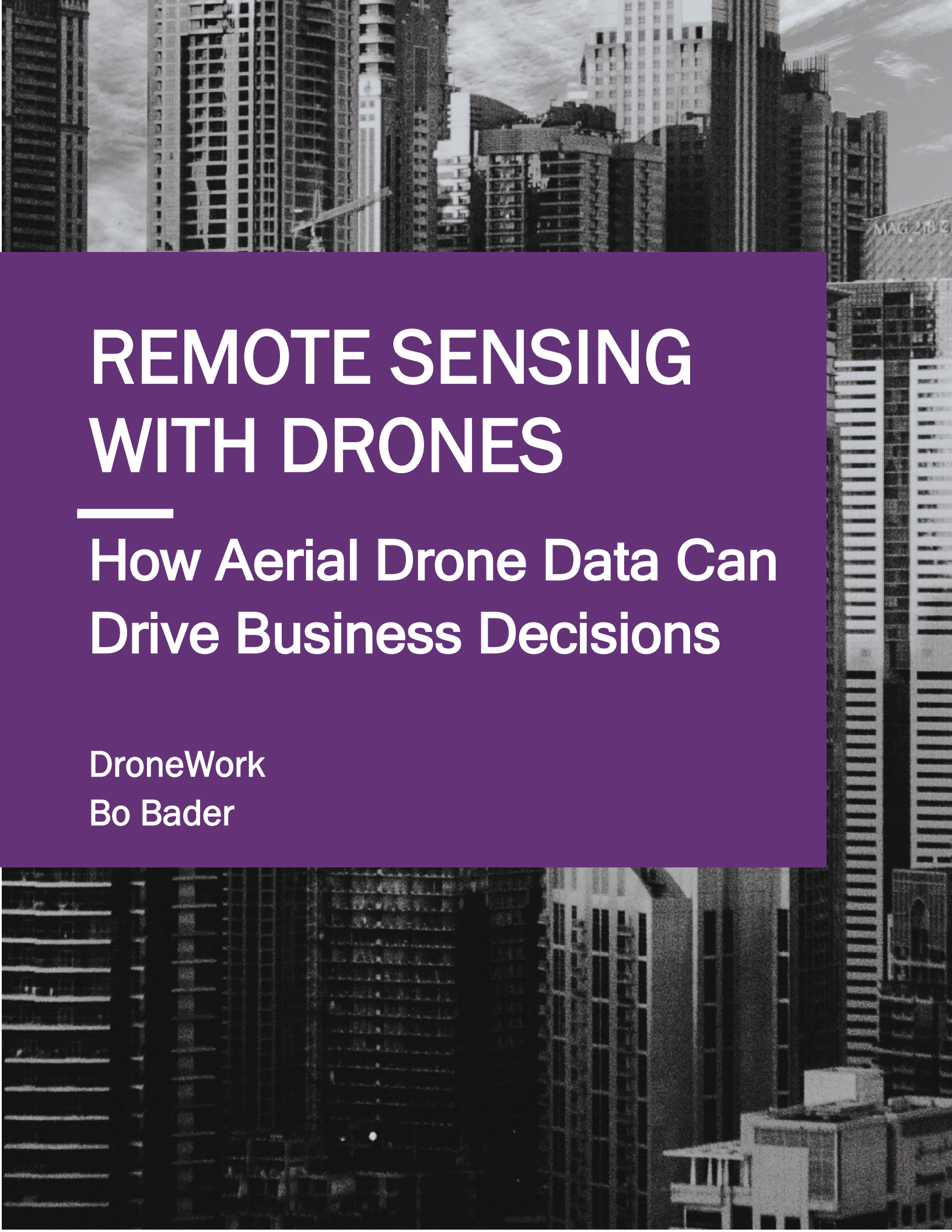


REMOTE SENSING WITH DRONES

How Aerial Drone Data Can Drive Business Decisions

DroneWork
Bo Bader

Remote Sensing

Remote sensing is the science of obtaining information about objects or areas from a distance, usually from the sky using tools such as aircraft or satellites. Data is captured through remote sensing tools by detecting energy that is reflected from the earth. There are both passive and active remote sensors. Passive sensors respond to external reflections such as sunlight that give off natural energy of the Earth's surface. Active sensors use internal reflections to collect data about the Earth.

Remote sensing has been around for many years, and drones are just another means of collecting aerial data. There are pros and cons of using the different remote sensing tools, and there is opportunity to allow these technologies to complement one another. Additionally, drawing direct comparisons between these technologies are inherently difficult. Which solution is most cost-effective depends on your requirements, operating sector, and business model.

Data Collection	Satellite	Airplane	Drone
Cost	Satellites are costly to implement, but individuals can use tools such as Google maps for free.	Manned aircraft have the highest costs for aircraft, fuel, labor, etc.	Drones vary in prices, but companies can purchase quality consumer drones for less than $2000.
Quality	Good for basic overview.	Ok	Highest level of precision.
Amount of	Data is available across the globe.	Can capture large amounts of area in reasonable time.	Can only capture data based upon the operator visual line of sight and aircraft battery life.
Frequency	Yearly	6 months	On-demand

Drones

The benefits of drones as a remote sensing tool is that the aircraft can fly much closer to the ground and offer the highest level of precision, being able to detect accuracy within 2 cm. Barriers for drone adoption do exist such as the certification protocol in which one must past an airman certification example mandated by the Federal Aviation Administration (FAA) in order to legally fly commercially in the United States. Additionally, the current FAA rules require a drone operator to obtain visual line of sight of the aircraft, meaning surveys cannot exceed a couple hundred acres. Although the drone industry is in the early stages of being adopted, 88% of companies with an internal drone program have seen a positive ROI in one year or less.

GIS

Quoted from GIS giant, ESRI, “If a picture tells a thousand words, then a map tells a thousand pictures.” A geographic information system (GIS) is the process of taking aerial data imagery from a remote sensing device and generating it into visualizations that analyzes features of events on Earth. GIS integrates a variety of data types and originates from the science of geography. It can analyze spatial location and organize layers of information into maps or models. From this amazing functionality, GIS reveals deep insights into data such as relationships, patterns, and situations that ultimately help users make more informed decisions.

Uses of GIS

- Identify problems
- Forecast
- Monitor change
- Manage and respond to events
- Understand trends

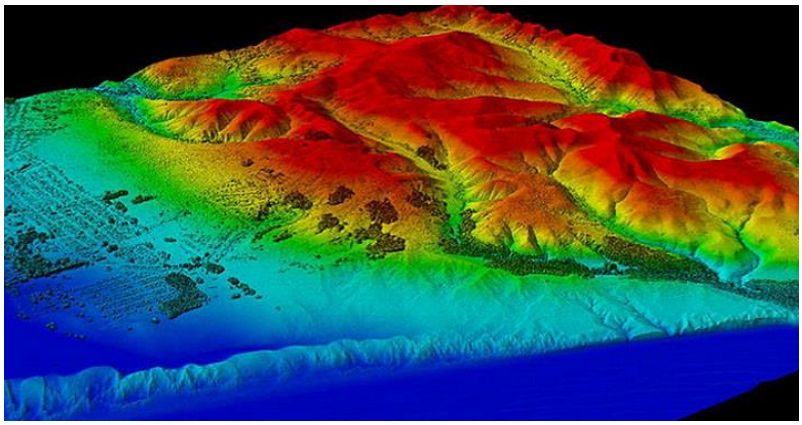
GIS technology applies geographic science with remote sensing tools such as drones to better collaborate and understand the world’s characteristics. The overarching goal is to gain intelligence from a variety of data that can be used to drive decisions and act.

Sensors

Businesses who use remote sensing tools such as drones need to be able to draw business insights from the aerial imagery. In order to get the highest value of data, the use of advanced sensors is needed to enrich information, bring clarity to challenges, and improve decision-making. LiDAR, hyperspectral, multispectral, and thermal sensors paired with drone technology can provide detailed precision resulting in the creation of powerful maps and models. When these deliverables are processed by algorithms, it can identify some of today’s most pressing challenges.

LiDAR

Light Detection and Ranging or LiDAR sensors use lasers that presents light energy in order to scan the ground and measure the energy ranges that are reflected. LiDAR is commonly used to create high resolution digital surfaces, terrain, and elevation visualizations used by different applications to provide business insights. In the past, companies would use a separate system to produce LiDAR applications, but now deliverables can be achieved through using a drone with a mounted LiDAR sensor as a turnkey mapping device.

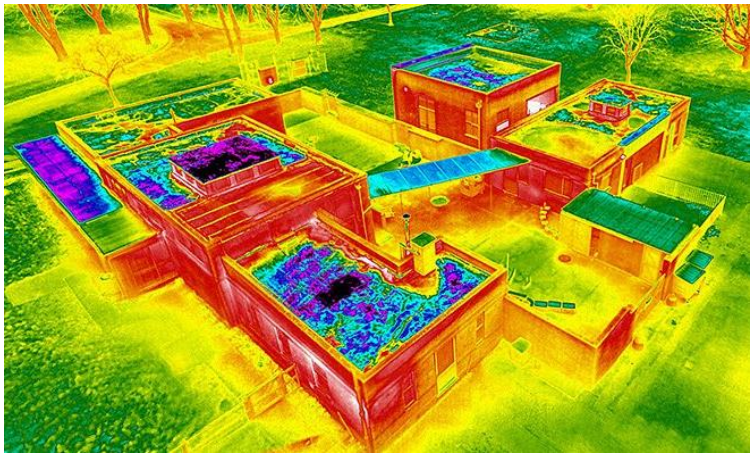


Hyperspectral & Multispectral

Hyperspectral sensors collect aerial data in a series of narrow bands of light. This data is not identified by other sensors. Multispectral sensors are used to capture used to capture near-infrared radiation (NIR) and ultraviolet light which is not identified by the human eye. With these sensors, each pixel gets their own information profile containing location data, followed by many digital numbers that align with corresponding spectral bands. Hyperspectral and multispectral sensors can also be used in tandem to detect and identify minerals, vegetation and other materials

Thermal

Thermal sensors measure the relative surface temperature of the land to create imagery. Thermal imagery shows variations in total radiant energy allowing for temperature calculations that are used to draw insights into heat stress, water use, and much more.



Orthomosaic Maps & 3D Models

An orthomosaic map is a representation of an area that is created by a series of overlapping aerial images that are stitch together and geometrically corrected. An orthomosaic map can be used to measure true distances, because it is an accurate representation of the Earth's surface. Similarly, to the creation of orthomosaic maps, 3D models are developed by adding oblique images. When these maps and models are processed with algorithms, they provide insights about distances, areas, and volumes.

Summary

Remote sensing technology such as drones is what is used to capture high quality aerial imagery. Using this aerial data to process in a GIS allows for the creation of maps and models. When using drone technology, the capture and delivery of data can be increased through sensing tools such as LiDAR, hyperspectral, multispectral, and thermal technologies. Pinpointing the problems to your operation is essential, as it allows the user to select the most appropriate remote sensing tool, sensing technology, GIS, and creating the most accurate deliverable for your operation.

DRONEWORK

References

Esri. (n.d.). Retrieved from https://www.esri.com/en-us/home

Home. (n.d.). Retrieved from https://skyward.io/

Industrial Drones | Drone Software & Analytics. (n.d.). Retrieved from https://www.kespry.com/

Powerful Drone & UAV Mapping Software | DroneDeploy. (n.d.). Retrieved from http://www.dronedeploy.com/

PricewaterhouseCoopers. (n.d.). Clarity from above. PwC global report on the commercial applications of drone technology. Retrieved from https://www.pwc.pl/en/publikacje/2016/clarity-from-above.html

Professional photogrammetry and drone-mapping. (n.d.). Retrieved from http://www.pix4d.com/

Skylogic Research / Drone Analyst - UAS / UAV Advisors. (n.d.). Retrieved from http://droneanalyst.com/