the GIS PROFESSIONAL

A publication of the Urban and Regional Information Systems Association

When Remote Sensing Fails, Add More Data!...

By: Adam D Sloat, College of Professional Studies, Northeastern University

While singular datasets can suffice for a particular need, sometimes multiple data sets are needed to deliver the goals of a project. This was the case in a recent drone mapping project by BSC Group Inc.

Original Plan
Using a drone with on-board RTK, original plans were to map a camp using photos captured in-flight through PhoDAR software. This software is designed to extract a contiguous orthoimage of the area flown, as well as data such as point clouds, DEM/DTM, and other outputs in a similar vein. PhoDAR is heavily dependent on the interaction of the photographs with each other, thus the accuracy of data is influenced by the stability of the airframe and the accuracy of the camera's geolocation of each photo.

Soon after the flight, it was apparent that initially planned methods were not working. Several issues occurred that cast doubt on whether it would be possible to deliver any product at all.

Key issues encountered were
- High-speed wind gusts;
- Ground control spacing and location;
- Flight planning configuration not set to best settings for the circumstances; and
- Difficult scene make up for software processing.

Any of these issues can be troublesome, but all of them together, in a single flight day, is a recipe for failure. The problems created included mixed image focus and shooting

Figure 1: Drone Landing gear in Photograph

angle, drone gear in some photographs (Figure 1), inconsistent image spacing, and a lack of solid GCPs to help overcome bad natural scene key points.

The RTK capabilities of the drone improved accuracy in other projects, sometimes removing the need for ground control in the right conditions. With the camp location, however, a large portion of the area was heavily wooded and even with leaf-off condition, the branches of trees created a confusing mass of lines which appeared different in each photograph. Without a good selection of fixed identifiable points in these scenes, the software returned a high rate of photo geolocation failure. Flown across five flights, the best result was just past 50% and the worst under 20%.

A key deliverable for the project is up to date orthoimagery, particularly of newly developed locations. This would serve to illustrate camp conditions as well as provide an up to date source for digitization of detail. While hi-resolution orthoimagery existed over the project area from the state of Connecticut, the temporal resolution of data made it of minimal value for these goals. Available LiDAR data of the area (Figure 2) was similarly problematic.

Alternative Plan

While each dataset proved insufficient on its own, data integration afforded a holistic solution.

As such, the Hi-resolution orthoimagery was geolocated and additional coordinates extracted for distinct features shared with the drone flight photos. While painful at times, locating enough distinct features was essential to develop a robust set of 2D ground control points. The accuracy of the points was not survey grade, by holding them at half foot accuracy, but they did help to increase the percentage of resolvable images.

With a respectable output report for the PhoDAR software, there remained a need to QAQC the results. Analysis of the LiDAR data, with aggressive delineation settings, helped to automate the location of as many buildings as possible. With many cabins and other small buildings spread out across the camp, it was important to gather a high number of cabin locations to test the PhoDAR results, even if it resulted in false positives.

The LiDAR building polygons quickly identified problem areas in need of additional GCP data. While the areas looked correct graphically, some of the building locations were off by as much as fifty feet (Figure 3), indicative of
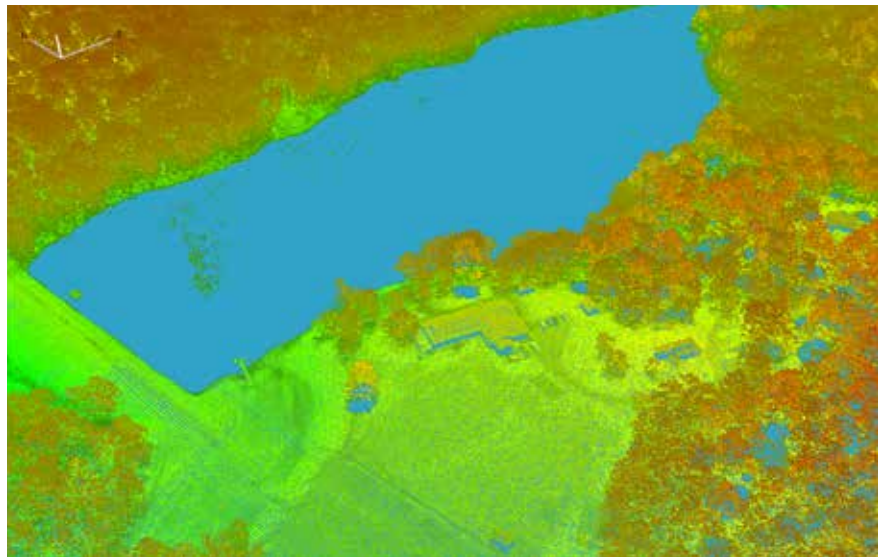

Figure 2: LiDAR Data of a Portion of the Site

Figure 3: The shift of LiDAR data with Initial Orthoimage

Figure 4: Corrected Orthoimagery

a high general geolocation error.

Once PhoDAR geolocation issues were corrected using LiDAR as input (Figure 4), site details still needed to be digitized. Unsupervised classification was applied to the orthoimages to help identify details in the camp landscape difficult to locate by visual inspection.

Using both VIS and NIR bands, data were put through a k-means routine with some sample site data to label the results. A mixture of shadows and ground moisture conditions created difficulties in clear classification, but the newly classified image (Figure 5) still displayed distinct patterns useful for the study e.g., fieldstone walls, buildings, roads, and paths. This enabled quick highlighting of suspected detail locations that could then be checked against the PhoDAR output. In several instances, the classification helped show data otherwise missed in a simple visual analysis.

In sum, the combined analysis afforded respectable up-to-date orthoimagery output of the present-day site as well as digitization of the objects on the camp property (Figure 6). Even though the problems encountered created many challenges and headaches, they resulted in innovative alternate options for future projects, and a superior overall product for the original camp project.

Definitions:

LiDAR (Light Detection And Ranging): remote sensing technique for the measurement of 3D information using time delay of reflected signals.

PhoDAR: (Photogrammetric Detection And Ranging): also a remote sensing technique for the measurement of height using information from different acquired perspectives (structure from motion)

RTK (Real-time Kinematic): Used for satellite navigation with enhanced precision.

Contact:
universitysloat.a@northeastern.edu

Figure 6: Digitized Data from Orthoimagery (Portion)

Figure 5: Linear Features Highlighted

One-on-One Coaching: The Most Effective Way to Develop Your People

By: Jeffrey W. Foley

Effective one-on-one coaching is one of the most important skills a great leader must possess. Effective coaching inspires in others an internal drive to act ethically, without direction, to achieve goals. Effective coaching drives performance, builds competence and confidence, and ultimately enhances relationships. The best coaches help people find ways to make things happen as opposed to creating excuses why they can't.

Effective coaching also requires you to believe in yourself. You need to believe that you can have an impact in the workplace, and that you can inspire others to achieve their goals they might not otherwise achieve. The real question is not *if* you will make a difference, but *what* difference you will make.

Respectful, transparent, and regular face-to-face communication between leaders and their people breaks down barriers and builds trust. What you can see in a person's eyes or other body language can be revealing. While technology can be effective at times, it will never replace human contact for discovery and inspiration.

The most impactful leaders are adept listeners, and don't allow their egos to become roadblocks. When egos are alive and well, listening ceases, effective coaching environments disappear, and organizations suffer.

Here are three recommendations that can help you raise the bar on your ability to coach others.

1. Create a positive and open environment for communication

People listen to and follow leaders they trust. They engage in meaningful dialog with people they trust. They are not afraid to disagree with people they trust. Trust provides the foundation for a positive and open communication environment where connections between people can thrive.

When people connect, they learn about each other. They enable understanding of cultures, individual strengths and challenges. Knowing your people's unique capabilities and desires helps focus on how to help them be successful.

Knowing your people also reduces the probability of promoting someone into a management position who does not want it or is not otherwise qualified. Not all physicians want to be managers. Not all sales people want to be sales managers. Not all technicians want to be a shop foreman. The costs can be exorbitant to an organization

The most impactful leaders are adept listeners, and don't allow their egos to become roadblocks.

that wrongly promotes someone into a management position.

There are three questions that can help establish this open line of communication: What is on your mind? What can I do for you? What do you think? How am I making your life more difficult? When asked with the genuine interest, people respond with more honesty.

Meet with your people regularly helps break down barriers. Not just in your office, but on the manufacturing floor, outside the operating room, in the cafeteria, or the warehouse. Talk to folks outside the work area like the jogging track, grocery store or the kid's soccer game. The informal sessions can be wonderful enablers of opening the line of communication.

2. Establish agreed upon goals and strategies to achieve

Most people want to know what success looks like. They want to be clear in their goals as an individual and, if appropriate, the leader of a team. Well-defined, measurable, relevant goals on paper help people gain clarity on success for them. Assigning responsibility with authority helps inspire an individual's commitment to be successful.

Success also includes how to reach their goals. Strategies are developed and agreed upon by the manager and team member so that both understand each other's roles. The probability of success increases dramatically when strategies and accountabilities are well defined.

3. Enforce accountability by assessing performance

There are many and significant consequences when people are not held accountable for achieving goals or otherwise performing to standard. Integrity disappears. Discipline erodes. Morale evaporates. Leaders are not taken seriously. Problem employees become

a cancer in the organization. The best people leave. Results are not achieved.

Effective coaching demands assessment of performance. Without this assessment, no system of accountability will be achieved. If the senior leader does not hold his or her executive team accountable, subordinate leaders are likely to think "Why should I?"

Consistent, regularly scheduled coaching sessions with your people are the key to ensuring effective follow-up assessments to celebrate successes and identify areas to improve.

Summary

Coaching session agendas will vary based on a variety of conditions. A good place to start is outlined below.

First, review the individual goals and those of the organization. Ensure alignment of both to clarify where the individual is contributing to the mission of the organization.

Second, discuss what is going well. Where do both the coach and the individual agree on successes? Provide positive recognition for achievements where important.

Third, discuss the challenges or areas for improvement. Underwrite honest mistakes in the pursuit of excellence so people can learn. Determine how you as the manager can help. Gain a clear understanding of the shortfall in the individual's ability and desire to achieve the goal and what resources or assistance the individual needs to be successful. When unsatisfactory performance occurs, managers must address it. Leaders who never take action to remove an underperformer are doing a great disservice to their institution. All too often, good people serving in leadership positions fear the task of confrontation. They hope, magically, that something will happen which will turn the underperformer around and all will be well in the end. Hope is not a strategy; the magic seldom happens. Your goal as a leader and coach is to inspire a willingness to succeed. When coaching, it is often easier to criticize and find fault. Think before you speak—find ways to praise.

Fourth, as the manager, seek suggestions for how you can be a more effective leader for them. This question can change the dynamic of the coaching session and can provide powerful feedback for the manager in his or her quest to be the best they can be. Doing so will enhance their trust in you and help build confidence in their own capabilities.

Remember, effective one-on-one coaching can be the catalyst for attracting and retaining the best people, and that will ultimately help your organization to unprecedented results.

ABOUT THE AUTHOR:

Jeff Foley is a recognized speaker, executive leadership coach, and author of Rules and Tools for Leaders. He is a West Point graduate and retired as a Brigadier General having served thirty-two years in the Army. Drawing on his unique military experience, Jeff uses his singular insight to build better leaders. For more information on Jeff Foley, visit www.loralmountain.com.

Thanks to the URISA Board members whose three-year terms are concluding at the end of GIS-Pro & CalGIS 2018!

Your dedication to the organization has been nothing short of amazing!

**Immediate Past-President:
Tripp Corbin, GISP**
eGIS Associates, Inc,
Dacula, Georgia

**Treasurer:
Stephen Berry, GISP**
Clark County Consortium
for GISWinchester,
Kentucky

Keri Brennan, GISP*
Michael Baker International
Indianapolis, Indiana

Corey Halford, GISP
Calgary, Alberta Canada

* Keri is continuing on with another term on the Board. She will be President-Elect.

Stop Falling Behind Your Competitors Seven Steps to Gain a Competitive Advantage

By: Brad Wolff

Doesn't it seem that business is more competitive and difficult than it used to be? *ABC, Inc.* experienced this challenging business atmosphere firsthand. A building materials manufacturer that previously dominated their marketplace, ABC suffered staggering losses in the previous fiscal year. It became blindingly apparent that what had worked in the past was no longer effective, and the company president had no idea how to fix things. It was time to use proven techniques for achieving a competitive advantage.

ABC engaged a firm that identified the root causes of their problems. After two years, sales and profits dramatically increased—even with the same leaders. The results came from a seven-step process based on sound principles that put a focus on leveraging their internal talent. If you find your business falling behind, you can follow ABC, Inc.'s lead by putting these seven steps into practice.

1. Employee alignment

When a significant percentage of duties performed by employees don't fit their innate characteristics or core nature, they won't perform well. For example, people low in detail orientation doing work that requires high detail. Training and development, management encouragement and other well-intended efforts will not fix alignment issues. As Peter Drucker said, "A manager's task is to make the strengths of people effective and their weaknesses irrelevant."

2. Creating a competitive advantage through a culture of personal growth and development

In truth, personal growth results in professional growth. It results in a greater capacity to handle life challenges, accomplish long-term goals and work well with others. Personal growth and development includes an increased awareness of self and others, the ability to manage one's ego, ability to manage emotions and development

of innate talents to maximize productivity and effectiveness. Most performance issues that managers complain about relate to one or more of the above. These are fundamental character traits of success.

3. Aligning employees with the mission and vision of the organization

Human beings have an innate need for meaning and purpose in what they do. This means that they care about how their efforts affect the world outside themselves—people, the environment, animals, etc. For example, take assembly line workers that produce incubators for premature babies. In one scenario the workers are only told to mechanically perform the prescribed duties. In the other scenario they are crystal clear about the importance the quality of their work has on the survival of infants. Which workers do you think are more motivated? Engagement and performance are directly affected by people's connection to the outcomes of their work.

4. Aligning employees with the culture and values of the organization

People need to feel that they fit in with their social groups. Employees who are significantly out of sync with an organization's culture and values will never make their highest contribution. Having perfect alignment is the point, since diversity of thought and behavior allow a culture to adapt and thrive. However, significant misalignments are damaging. It's also important for leaders to consider whether they should change their culture. Examples of this would include a culture that they know is toxic and when there's shrinking population of workers who fit the current culture. In both cases, without the ability to attract and retain needed talent, organizations will fail.

5. Aligning roles and responsibilities with organization's strategies and goals

In today's environment, organizational goals and strategies must change to adapt. Frequently, roles and supporting job duties don't adequately change to align with these shifts. When this occurs, some or much of employee work efforts are out of alignment and can impair the ability to achieve the desired outcomes. For example, a company changes strategy to shift most customer communications from telephone to online, yet the employees' duties and training continue to focus on telephone communications.

6. Assessing personal and professional weaknesses, starting from the top

Weaknesses are the negative side of strengths. It's impossible to have a strength without its vulnerable side. We've been taught to hide or deny our weaknesses despite them being obvious to others. Our ego's impulse to protect our self-image is normal but counter-productive. It hinders our true potential from being realized— a loss to the organization and ourselves. When leaders openly and honestly acknowledge "challenge areas," this sets the example for others. The organization opens the door to growth and development.

7. Committing to work on the personal and professional challenges discovered in the assessment process

Studies on human potential and positive change demonstrate that self-awareness is the first step—but it's not the last. Committing to take steps (starting with baby steps) and taking them allows for the development of positive habits that create lasting positive change. Deliberate change intended to meet the needs of your environment creates a flexible, adaptive organization—ne that is poised to thrive despite the torrent of unpredictable/unwanted change that defines your world. Thriving in an unpredictable world is about you. Your willingness to acknowledge change that you don't like, openly discuss it and consistently take the actions required to adapt and emerge stronger.

At the end of the day, leaders are simply making choices that define the present and future of themselves and their organizations. There's nothing magical about the most effective leaders. They're just making more effective choices. These choices encompass how they decide to see the world, their openness to challenge their beliefs and their willingness to experiment with innovative ideas that can capture breakthrough advantages. Equally important choices include their willingness to objectively look at themselves and take actions to grow in areas. They choose to become a greater, more effective version of themselves. They know that what they demonstrate (not what they say) is what has the greatest impact on the entire organization. As a leader, the question is, what choices are you going to make?

ABOUT THE AUTHOR:

Brad Wolff specializes in workforce and personal optimization. He's a speaker and author of, People Problems? How to Create People Solutions for a Competitive Advantage. As the managing partner for Atlanta-based PeopleMax, Brad specializes in helping companies maximize the potential and results of their people to make more money with less stress. His passion is empowering people to create the business success they desire, in a deep and lasting way. For more information on Brad Wolff, please visit: www.PeopleMaximizers.com.

Presentation Proposals Invited for GIS/CAMA 2019

GIS/CAMA 2019 • Portland, Oregon
February 25-28, 2019

Submit a presentation proposal for GIS/CAMA 2019 in Portland:

- Presentation proposals are due on or by October 15, 2018

For complete details and online submission forms, click here.

Here's what some of this year's attendees in Houston (March 2018) had to say:

- It is far better than any local conference I have attended. Go to this conference to see what a "real" conference is like.
- Best conference to attend all year! Great that it is both GIS & CAMA and so relevant!
- It is interesting to see what others have done and maybe we don't have to reinvent the wheel.
- I've met many of the best professional contacts at GIS/CAMA. It's great to share ideas & inspiration with others who "get what you do."
- It's a great user-led conference for applicable solutions.
- GIS/CAMA is a must-attend for any assessment office that is maximizing its budgetary resources by leveraging technology to achieve the proper balance of people, time, and money.

LETTER TO THE EDITOR

Dear Jordan,

Thanks so much for your entertaining and valuable review of the two recent Esri MOOCs you joined. We could not be more pleased with your clever and effective writing or your honest and accurate comments. We did want to share some reactions to a few of the issues you raised.

You enrolled in and both Cartography. and The Location Advantage at the same time. While individuals with lots of time on their hands may want to tackle more than one MOOC at a time, anyone with full time commitments may want to stick to one at time (whether it's an Esri MOOC or one from other provider or an online course in a degree or certificate program). We are reviewing the suggested weekly time requirements for our MOOCs; we agree that 2-3 hours is perhaps best described as a minimum commitment. By the way, we "pair" our MOOCs based not on how they may complement one another, but on something sadly practical: the availability of our MOOC team members.

You noted that course dialogs were mostly unidirectional, from instructor to student. We are working hard to include more interaction into our MOOCs. The course forums are open 24/7 and we are pleased to hear from a good number of students that the conversations hosted there were among the most valuable parts of the course. We are tweaking the forum interface to allow for better searching and tagging; this becomes especially important when 18,000 students are participating in a course offering, as was the case with Cartography. this past spring.

You identified a number of differences between The Location Advantage, our second MOOC from 2015, and Cartography., our fifth MOOC from 2018. The MOOC team has learned quite a lot in the intervening years and incorporated new ideas, techniques, and tapped other Esri teams. Much credit goes to the Esri Creative Lab staff, which directed, produced and edited the short films you saw in Cartography. We didn't have access to that sort of set and talent back in 2015. We are currently revisiting our early MOOCs to determine how to update them. In September are beginning production on an update to our first MOOC: we are developing season two of Going Places with Spatial Analysis.

We hope you'll join us for another Esri MOOC soon! Here's what's coming up:

2018 Third and Fourth Quarter MOOCs

- Do-It-Yourself Geo Apps: Sept 5 – Oct 3, 2018 (four weeks; all content opens on the first day)
  John Shramek, who helped develop and has been teaching The Location Advantage MOOC, will teach this offering. While much of the course has not changed and focuses on building apps without any programming, John enhanced the exercises to introduce students to Survey 123 and Operations Dashboard. http://arcg. is/2kqHWz6

- Cartography.: Sept 5 – Oct 17, 2018 (six weeks; new content opens each week)
  This is the second offering of the course from Ken Field, Edie Punt, John Nelson, Wes Jones and Nathan Shephard. Student feedback suggests this course, which highlights ArcGIS Pro's cartographic features, is also a great introduction to the software. http://arcg. is/2teM7VN

- **Earth Imagery at Work: Oct 31 - December 12, 2018 (six weeks; new content opens each week)**
  Kevin Butler leads students through scenarios highlighting how imagery is used in a variety of disciplines including disaster response, agriculture and commercial business. Students are often surprised at how many imagery exploitation tools are available in ArcGIS Online and ArcGIS Pro. http://arcg.is/2jMPFoQ

2019 First and Second Quarter MOOCs

- Going Places with Spatial Analysis February 6 - March 21, 2019 (six weeks; new content opens each week)
  Linda Beale, the very first Esri MOOC instructor returns for "Season Two" of this spatial analysis course. Students will use Insights for ArcGIS and tackle new hands-on exercises. http://arcg.is/2kUAeRi

- Do-It-Yourself Geo Apps: February 6 - March 6, 2019 (four weeks; all content opens on the first day)

- Cartography.: April 10 - May 23, 2019 (six weeks; new content opens each week)

- Earth Imagery at Work: April 10 - May 23, 2019 (six weeks; new content opens each week)

We appreciate you sharing your Esri MOOC experience with others and look forward to your next review, article or column on geospatial topics.

David DiBiase, Director of Education, Esri
Adena Schutzberg, MOOC Program Manager, Esri

GIS-Pro & CalGIS 2018

October 9-12, 2018
Palm Springs, California

Full Program Details

Featured keynote speaker
– Jack Dangermond

GISP Certification: As always, this event earns ample Education points toward GISP initial certification and renewal.

AICP-CM Approved Credits: The Palm Springs program was approved for **90.5 AICP-CM credits**! For the breakdown, click here or download the PDF summary.

Be sure to check the box on the registration form or email URISA if you are interested in taking advantage of onsite childcare services during the event. **#GISBabies #FamilyFriendly**

We are hosting a silent auction to support fundraising for URISA's GISCorps ! Get ready to bid! If you have an items(s) to contribute to the auction, please email URISA.

In addition to valuable meet-ups and networking events, URISA's Vanguard Cabinet of Young Professionals is sponsoring K-12 and University student competitions and a Young Professional competition! More here**.**

Check out this **Story Map of Palm Springs attractions**. You might want to plan an extended visit in October!

President's Corner

Teresa Townsend, AICP

Looking Back & Moving Forward….

As I sit down to write my final president's column, let's take some time to celebrate and reflect on URISA's progress and tremendous strides over the past year and keep our focus in moving forward into 2019.

LOOKING BACK
Highlights from 2018…
STRATEGIC & ACTION PLAN

Thinking and acting in a strategic direction was foundational for URISA over the past year and the current Strategic Plan was the guiding document for all.

The 2017-2018 Strategic Plan was approved on October 26, 2017 (revised/updated in Feb. 2018) and includes goals & objectives and an Action Plan effective from GIS-Pro 2017 to GIS-Pro 2018. Goals and objectives were defined in the current Strategic Plan to reflect URISA's mission and 3 Key Strategic Goals. All goals and objectives include actions which are integrated into the work of URISA committees, task forces and organizational initiatives for a comprehensive and unified approach.
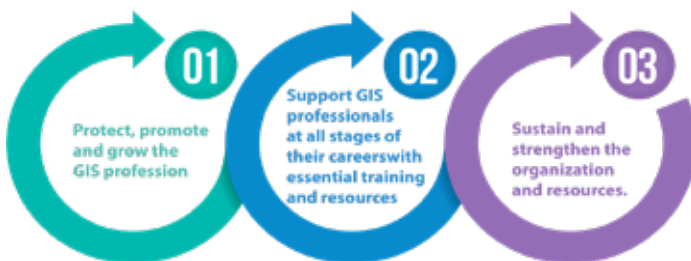
ADVOCACY
Chapter Support

Policy Advisory Committee (PAC) provided requested outreach and support for several chapters on GIS and industry-specific policy actions.

Boundaries of Practice

The newly published paper, "Boundaries of Practice" reviews the current definition of professional boundaries in respect to surveyors and GIS professionals and outlines areas of overlap and distinction between the industries.

Highlights from 2018 Legislative Input & Collaboration with Industry Partners

- URISA and its Four California Chapters Urge Support and Continued Operation and Funding of California's Geodetic Control System- **April 2018**
- URISA signs onto Census Project stakeholder letters to the House and Senate expressing concern regarding citizenship question- **April 2018**
- URISA signs onto Census Project stakeholder letter expressing support for sufficient funding for the U.S. Census Bureau and, in particular, 2020 Census activities in Fiscal Year (FY) 2019.- **May 2018**
- URISA Urges Support for the National Agriculture Imagery Program - **May 2018**

Special Interest Groups (SIGs)

URISA has recently approved and re-introduced Special Interest Groups (SIGs) to create a forum where a group of individuals can focus on specific issues or interests in the GIS industry. Specifically, an Addressing and Land Records SIG is expected to be starting up soon as well as others in the near future! This is a perfect avenue for members to engage in topics of keen interest to them.

LEADERSHIP ACADEMY:
TRAINING & RESOURCES
GIS Leadership Academy

Due to the high volume of participation and interest, the GIS Leadership Academy was expanded this year and continues to gain momentum.

In 2018, 161 graduates (a 66% increase from 2017) from all over the world participated in the URISA GIS Leadership Academy. Plan to attend the next one in Austin, Texas on December 3-7, 2018 or sign up for 2019!

GIS Salary Survey

The 2017 GIS Salary Survey was published this year! URISA's GIS Salary Survey is an ideal resource for both job seekers and those who hire GIS staff. As in the past, an Executive Summary is available for FREE and a comprehensive analysis of the results is available for purchase.

Professional Education

The Professional Education Committee has been working tirelessly to expand and update URISA's education offerings as well as develop

workshop procedures and workflows for publications and educational offerings. Check out some of the many accomplishments that rolled out this year:

Published FAQS
Multiple FAQs on topics such as Census 2020, the Geospatial Data Act, Open Source GIS, and Address Data Management were developed and published.

NG911 Task Force & Workshops
URISA has an active NG911 Task Force which is developing additional educational content to support GIS professionals in this important endeavor and is also a proud partner of the NG911 Now Coalition, whose mission is to promote an accelerated implementation of NG911 throughout the nation. URISA's NextGen 9-1-1 and the GIS Workflow workshop is, by far, the most frequently requested URISA workshop which shows how important the community views the topic.

Asset Management Workshops
URISA's Asset Management workshop has been presented 3 times this year and a brand new Asset Management Systems 201 half-day course is debuting at GIS-Pro & CalGIS 2018.

GISP Certification Preparation Workshop
A GISP Certification Preparation workshop was presented at GIS-Pro 2017 with over 50 in attendance. This was followed by a two-day webinar on the same topic in March 2018 attended by over 60 participants. A full day workshop at GIS-Pro & CalGIS 2018 is scheduled and already has well over 50 registered to attend.

The GIS Professional
Regular issues of THE GIS PROFESSIONAL have been published.

ONEURISA IMPLEMENTATION
URISA is pleased to announce that two chapters, **Louisiana (LA URISA) and New England (NEURISA) will soon be the first two chapters under the NEW Unified Membership Model. U**RISA is finalizing the process with these chapters and is in coordination with other chapters as they take steps to move forward with OneURISA. For current information and status, visit the OneURISA webpage, https://www.urisa.org/chapters/oneurisa/

URISA.org
A new website, urisa.org was launched this year!! Creating a dynamic and modern website was key to the development of URISA's new website. Bookmark it and check back frequently as there is always something new and exciting being added.

YOUNG PROFESSIONALS
URISA continues to expand opportunities for young professionals. Members of the Vanguard Cabinet (VC), https://www.urisa.org/vanguardcabinet, regularly collaborate with URISA leaders and committees to create programs geared toward other young professionals.

URISA's Young Professionals Scholarship
URISA has launched a new scholarship for select young professional URISA members to broaden their horizons through attendance at the GIS-Pro conference. http://www.urisa.org/gispro-studentsyps#scholarship

352
38% increase in Young Professional & Student Members since January 2018

- **86** New Young Professional Members
- **48** New Student Members

Vanguard Cabinet Mentoring
The URISA Mentoring Network, the newest iteration of the VC Mentoring Program, calls upon URISA members to serve as potential mentors to one or more young professionals. "Opt in" to this program this year as you renew your annual membership!

Vanguard Cabinet Strategy & Vision
In preparation for the new 2018 Vanguard Cabinet members, the Vanguard Steering Committee worked with the Vanguard Cabinet to update a new VC Strategy Document which defined and refined guidelines and policies for VC governance. Building on that process, the Vanguard Cabinet with the support the Steering Committee developed strategic goals and strategies to support URISA's adopted Strategic Plan which includes focus in the following areas: university and educational outreach, young professional outreach, local URISA members & chapter involvement, scholarship and funding opportunities.

MOVING FORWARD....
URISA continues to be focused on our membership and in building a stronger and more unified organization together with URISA chapters, institutional, agency and business partners. Key aspects include: implementing the current Strategic Plan; supporting growth and development of URISA chapters; continued implementation of the unified membership model (OneURISA); and continuing to build on/expand member benefits and educational offerings. It is essential that URISA continue to keep that forward movement through modernization and build upon the vision and legacy the organization has established over the last 50+ years! Thank you for the opportunity to serve as URISA President and I look forward to seeing you at GIS-Pro!

Creating and Sustaining Inclusive Workplaces: Beginning the Conversation

By Laxmi Ramasubramanian, PhD, AICP

- A technical expert enters a board meeting room, where a group of other technical experts are gathered. The secretary to take notes is finally here; we can get started, someone says.
- An executive director of a nonprofit begins to discuss the issue of diversifying recruitment strategies at a regular organizational meeting. Another colleague dismisses the suggestion by interrupting the director and states that there are more important matters that should be discussed that day.
- A graduate student presenting their findings at a professional meeting is verbally bullied by another attendee.

These vignettes highlight some challenges that women experience in their professional lives. Regrettably, these vignettes are not fictional. Even a casual search on twitter or another social media platform will confirm my observations and provide further evidence about the types of negative situational behaviors I have highlighted. Recognizing and addressing the challenges of diversity in the workplace is a collective responsibility for our field and profession. This means thinking and talking about diversity in the workplace in a serious way. It has to be much more than planning to recruit a few more women to join the team. In this short essay, I want to begin a conversation about creating and sustaining inclusive workplaces.

Some will argue that the geospatial sciences have had an egalitarian and inclusive history. It is true that women and people of color have been active and engaged in GIS research, teaching, and professional practice since we coalesced as a field in the early 1970s. Professional societies like URISA and large GIS companies like Esri have long recognized the need for and the value of diversity (not exclusively focused on demographic diversity alone).

However, women in the geospatial sciences continue to face a number of challenges that inhibit their professional development. I will discuss three challenges: 1) recruitment; 2) retention, and 3) identifying leadership opportunities.

Recruitment

Recruiting girls and women into science and technical fields like ours is a recognized challenge. This is a problem that needs to be addressed at the high school level. We need to work with a variety of partners to address the problem. Since geospatial sciences are not a designated subject within typical high school curricula, students connect with GIS through related fields like computer science or through applications courses in geography and urban planning. Many URISA members give generously of their time to work with students on their GIS projects and participate in other outreach activities in their local communities such as the GISCorps. But, we must do more, way more!

Moving into the higher education landscape, introducing core geographic and GIS concepts and methods to undergraduate and graduate students is essential to our field remaining stable and sustainable. Increasingly, students have to acquire proficiencies in programming languages like R and Python as well as web-services architectures, not to mention proficiency in graphic communication in order to be effective in the workplace. There are different ways and venues to deliver this content. Our colleges and universities must partner with our professional societies to attract women to invest their time in these technical pursuits. While a great deal of attention is being paid to address the gap in Science Technology, Engineering, Mathematics (STEM) fields, the geospatial sciences often misses out because of our interdisciplinarity and our transdisciplinarity.

Retention

Recruiting talented women to study and become proficient in the geospatial sciences is the first step. All too often, women change fields, leaving the geospatial profession for careers in other areas that are more welcoming or perceived to be more welcoming. This problem is particularly relevant for those students who are contem-

> Women in the geospatial sciences continue to face a number of challenges that inhibit their professional development.

plating careers in research whether it be in academia or industry. Advanced research careers often require specialized preparation and credentialing in the form of a PhD. We need to encourage women to pursue and complete their doctoral education so that we can continue to populate our research institutes and our higher education institutions with scholars who can develop new cutting edge research methods to advance our discipline. Good research and development is essential for our field to flourish. Although GIS and related technologies are now ubiquitous and invisible, new research investments and partnerships between industry and academia are needed to support new innovations. Many promising women graduate students do not pursue doctoral education or a career in research because of challenges that are related to their gender, rather than their talent or academic preparedness. Similarly, women entering professional workplaces are opting out because of a perceived

or real hostile work culture and climate. We are hurting our field if we do not address this retention gap[1] (Betancourt-Mazur et al. 2015).

Leadership

Thinking about the future, we need to encourage women to aspire and compete to achieve leadership positions. Without a doubt, we have several strong women leaders as role models in professional service (e.g., URISA) and as owners of small consultancies but we need to grow the number of women who are leaders in their fields in academia, government, larger companies, and the nonprofit sectors. I am heartened by the efforts of the groups like the **Women in GIS** group, now a non-profit organization.

I would like to close with a brief description of a program that several geospatial scientists from academia and industry are championing to *train and retain leaders in STEM-Geospatial Sciences* (TRELIS) with a particular focus on women engaged in academic research and teaching. With support from the National Science Foundation and in partnership with the University Consortium for Geographic Information Science, we plan to run leadership and capacity-development workshops to engage women in academia. We would like women in these workshops to think critically about challenges that inhibit them (and their peers) from achieving their personal and professional goals and to develop practical skills and strategies to address these challenges.

The first two-day workshop concluded in Madison, Wisconsin this past June. It was held in conjunction with the meetings of the

1   Betancourt-Mazur L, Albrecht J and N Huynh 2015. Women in GIS. URISA Journal, 27(2): 51-64.

University Consortium for Geographic Information Science and AutoCarto. When we announced the call inviting participants, we were overwhelmed with the number of inquiries as well as completed applications. In practical terms, this meant that only one in three deserving applicants received an invite to participate in the workshop. But this is only a start. The first cohort of TRELIS Fellows is very energized and have spun off a new series of outreach and engagement activities. We anticipate that this snowball effect of engaging new cohorts of academic leaders will empower the next generation of women to become leaders in the geospatial sciences. For further information about TRELIS, please feel free to contact Professor Laxmi Ramasubramanian, PhD, AICP (laxmi.hunter@gmail.com)

There are many more questions and issues to consider. I hope that this essay stimulates a dialogue among the membership.

About the Author

Dr. Laxmi Ramasubramanian is a faculty member at Hunter College, the Past President of the University Consortium for Geographic Information Science, and a member of URISA. The views contained in this essay are hers alone.

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Golden Clam Award Winner

Kara Utter, 2017 URISA Young Professional of the Year, recently won the Golden Clam Award from the Southwest Idaho GIS Users Group (SWIG). The Golden Clam is an award of merit passed on to an individual in the local GIS community to honor their efforts and dedication to the GIS profession and Southwest Idaho. **Congratulations Kara!!!**

Volumetric Change Detection: Putting LiDAR Point Clouds to Task

By: Colin Johnson, MPS, GISP, College of Professional Studies, Northeastern University
Contact: c.johnson@northeastern.edu

Building change detection is useful for land management, disaster assessment, illegal building identification, urban growth monitoring, and geographic information database updating (Pang, 2014). As urban areas are prone to change rapidly over time it can be a challenge to monitor the extent of change in a systematic nature. Leveraging airborne light detection and ranging (LiDAR) is an effective method for detecting building changes across more than the traditional two-dimensional plane as the point clouds capture a full vertical relief of the underlying survey area. Change detection from aerial imagery alone is less effective due to shadows from skyscrapers and dense vegetation, diverse and ill-defined spectral information and perspective projection of buildings (Awrangjeb, 2015). Owing to these similar spectral characteristics, it is difficult to distinguish buildings from other artificial constructions as bridges and roads (Du, 2016); problems that can be potentially circumvented using LiDAR. This study proposes a systematic work flow that can replicated regardless of the study area or time-period. Raw point clouds are classified and resampled to both a raster Digital Surface Model (DSM) and Digital Terrain Model (DTM). The DSM's for the multitemporal imagery are normalized against one another to produce a raster product that quantifies change. A volumetric approach is then applied to qualify change within real estate parcels to showcase the practical application and a real-world scenario. Detection is capable of visually and tabularly showing areas of positive building change as well as variance to the negative showing building demolishing.

Data Preprocessing

For this study the sourced LiDAR data are both in the American Society of Photogrammetry and Remote Sensing (ASPRS) LAS 1.2 format and nominally classified as Unclassified (1) and Ground (2). This is the minimum classification needed for generating bare earth data. Additional point cloud classification needs to occur. Using Textron Systems LiDAR Analyst Extension, a bare earth extraction was developed, and points classified based on height and cluster analysis to delineate low, medium, high vegetation as well as buildings. It is important to classify the vegetative cover so that it can be filtered out for further analysis.

One issue that arose while preprocessing was a disparity between point spacing along flight lines in the earlier dataset, something not unique to this study. For instance, Peng ran into a similar issue in his building change detection model, the lack of textual information and uneven distribution of LiDAR point density make it hard to remove false changes caused by trees and terrain. (Peng, 2016). The solution to overcome this was found in processing the individual flight lines separately and then stitching them back together prior to classification. Another unexplored approach would be to evenly distribute the point spacing to match the lowest resolution in each collection.

There are two main schools of practice on building change detection from remote sensing data. Firstly, in the *direct* approach, data acquired from one type of sensor at two different dates are directly compared to detect changes. Secondly in the *indirect* approach, the building information is first detected from a new data set and then compared to that in the existing map (Awrangjeb, 2015). This study took the *direct* approach with no known information other than to compare two multitemporal image datasets against each other.

Workflow

Class filtering allows for a digital terrain model (DTM) and a digital surface model (DSM) to be generated for each of the two multitemporal LAS datasets. The creation of the two surface models was performed using radidlasso LAStools. The resultant surface models were normalized with ArcGIS Raster Calculator with this basic formula (Figure 1):

LiDAR Data(1): $nDSM(1) = DSM(1) - DTM(1)$
LiDAR Data(2): $nDSM(2) = DSM(2) - DTM(2)$

The nDSMs are created for both temporal surface models and then a delta is performed to estimate the change in the following formula (Figure 1):

$$\Delta DSM = nDSM(2) - nDSM(1)$$

The delta DSM (Figure 2) is used as the primary vector for quantifying building change between the temporal datasets.

As a test, a volume of change within tax parcels is computed and results written back to the tax parcel record (Figure 3). The model takes the delta DSM product as input and generates a Triangular Irregular Network (TIN) raster for each parcel. The volume of the TIN is computed and recorded for further analysis.

Limitations

Partial changes or angle of collection discrepancies accounted for many of the changes found in the study area. Reconciling these was achieved by a visual inspection and a judgment call on what threshold of volume would constitute an actual change, not just differencing due to sensor. This method, could be refined in subsequent studies to take the subjectivity out of the process. The end results of establishing a threshold in individual parcels can be called out and then visually inspected (Figure 4).
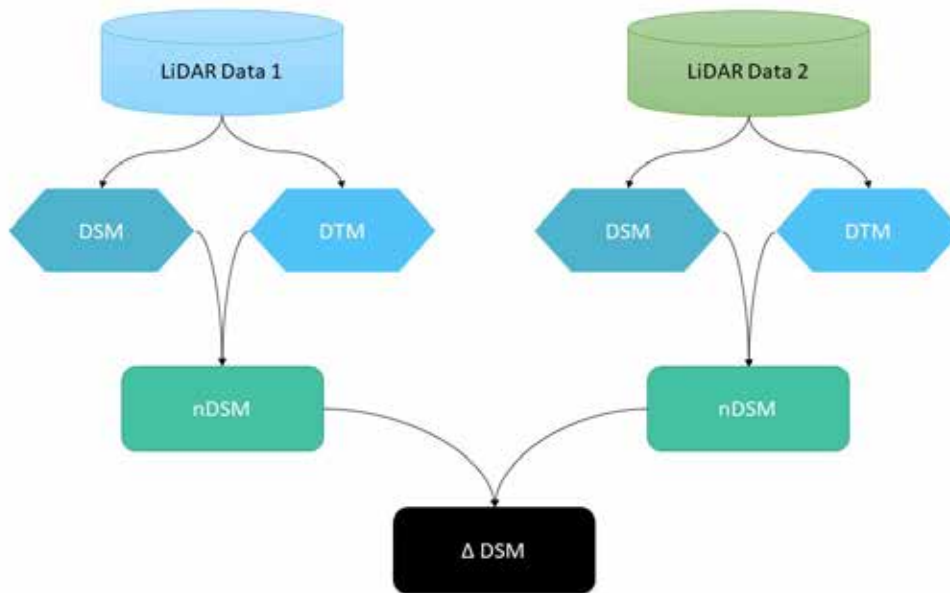
Figure 1: Workflow diagram showing classified point cloud data distilment to a delta of the digital surface models.

Further Study

In running through visual checks on the quality of the results there are some blatant errors in the process. Finding these points of breakage might not be as important as refining the overall process with the inclusion of object-based analysis or a combination of aerial imagery with the LiDAR. The combination of high resolution imagery and LiDAR point clouds based on Object Based Image Analysis (OBIA) method can be produced results at greater classified accuracy than the contributions of either field alone (Zou, 2016). Image segmentation and automated feature extraction could round out the analysis and provide some better insight on the where the current model is underperforming. The advantages of the combined approach lie in the fusion of the height and spectral information by thematic segmentation (Peng, 2016).

Conclusion

The study successfully generated a work flow that is simple in nature, repeatable, and can be done on a variety of software platforms. Though some commercial out of the box software was used, in hindsight everything could conceivably be ported over to a free open
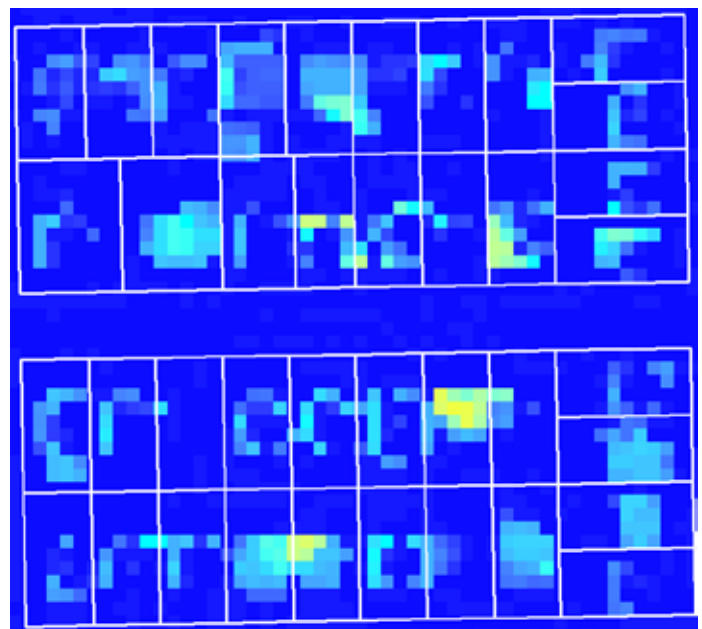
Figure 2: Delta DSM shown. Warmer pixels (yellows) indiciate higher rates of detected change, cooler pixels (blues) indicate lower or no change
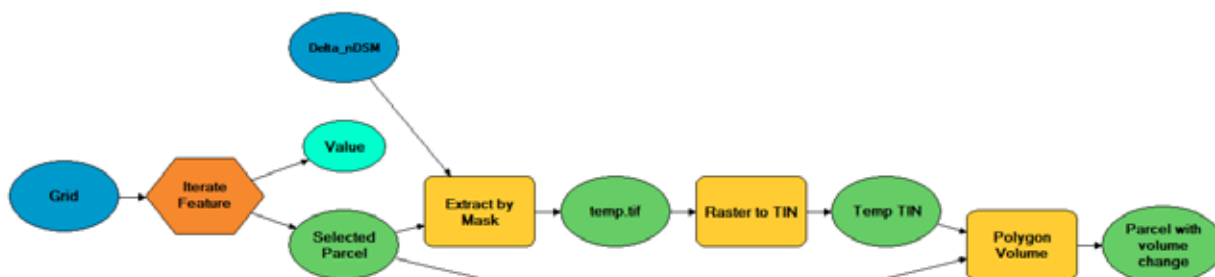

Figure 3: Workflow model to calculate volume of change within tax parcels

source solution now that a road map has been established. The bulk of the initial analysis could be handled in LAStools from the command line. The TIN creation and subsequent volume calculations could be performed readily in QGIS; this combination offers a free alternative and gives accessibility of the study to anyone.

Viewing this study as a launching point that invites further research and critical thinking is another positive outcome based on the results. The noted changes that were detected with the methods presented show a disparity of changes in reality. Though some changes are picked up, there are false-positives intermixed in the results.

When compared to existing change detection methods, the volumetric calculation based on classified LiDAR point clouds does well with "whole" building changes. "Partial" change, commission and omission errors with heavy vegetation, and variance in raw point cloud inputs are left to be explored in further study.

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Figure 4: Tax parcels with highest volume of change shown in red, moderate changes - orange, slight change - yellow. Parcels with NULL color indicate that the changes detected fell below the user defined threshold.

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- The survey is based on 3,060 respondents who are employed full-time.
- The average salary of survey respondents was $70,857 - an increase of 15% over the 2010 average of $61,540.
- GISPs, on average, earned $10,000 more than non-GISPs.
- A majority (57.7%) of respondents are employed within some level of government, from local to federal agencies.
- Most receive additional forms of compensation including health insurance, paid conference attendance, life insurance, paid training, pension/retirement plans and 401(s) plans.
- They spend an average of 70.8% of their time performing geospatial tasks and work an average of 41.6 hours per week.
- The minimum level of education required for their position is a Bachelor's degree.
- They have an average of 13.5 years of professional experience and have been in their current position for an average of 6.8 years.
- Less than half (42.5%) were GISPs.
- Two-thirds were male and the average age of respondents was 40.5 years.
- Most (90.4%) respondents were from the U.S. with the greatest concentration from the South Atlantic, Pacific, Mountain and West South Central regions.

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Our clients leverage our expertise and rely on our long history of proven performance to develop geo-related solutions, including Geographic Information Services, GPS survey and map grade data collection, geo-enabled photogrammetry, aerial imagery analysis and process-

ing, and cloud mapping.

As a trusted partner, we collaborate with our clients to identify their goals and deliver solutions and products that exceed expectations. Our team's cutting-edge technical capabilities meet the emerging survey, mapping, data collection, and application development needs of our clients, building on a strong foundation of experience and proven ability to perform and execute multiple, simultaneous task orders.

Learn more: Featured Projects

Evari GIS Consulting

Evari GIS Consulting, Inc. (Evari) was founded in 2009 with the mission of providing high quality, custom GIS solutions for municipal projects. Evari has a wide array of project experience supporting municipalities, utilities, and energy service companies, providing As-Needed GIS support for Transportation, Civil Engineering, Storm Water, Undergrounding Master Planning, Street Lighting and Planning projects. Evari is driven to innovate, employing GIS to streamline data management, empower field crews with mobile GIS technology, and facilitate Smart City, IoT solutions. With a focus on producing clear, accurate and valuable data, maps and figures, Evari's provides its clients with effective decision-making and project communication tools. Evari leverages the Esri Technology Stack (ArcGIS) and the Amazon Web Services Cloud Computing platform for a broad range of municipal GIS applications.

GeoDecisions

Since 1986, GeoDecisions has partnered with clients throughout the U.S. and abroad to design, develop, and deploy leading edge, disruptive GIS tools and applications that improve decision-making. Backed by Gannett Fleming, our rock-solid engineering parent company established in 1915, we combine the best talent and resources from across our firm to deliver the best business solutions.

Planning, budgeting, managing assets and data, and optimizing resources are critically important in today's global economy. At GeoDecisions, we provide the data management and mapping technology tools and products that help clients successfully navigate change. Our geospatial information technology (IT) offerings empower organizations to make more informed business decisions and improve their bottom line.

Partnering with industry leaders such as Esri, our turnkey approach encompasses strategic planning and implementation design all the way through system integration and testing. Our foundation for success is based on the belief that the true power of GIS lies in the integration of diverse information technologies, data formats, and systems. From cloud computing and mobile technologies to Software-as-a-Service (SaaS) offerings built on the Esri® platform, our location-based IT solutions provide next-generation reporting, visibility, and analytics.

GeoDecisions believes that all IT projects require vision and considerable leadership to be completed successfully, on time, and on budget. By championing a philosophy vested in partnering, collaboration, and shared goals, GeoDecisions' staff makes every effort to work with all parties who will use a system. We strive to recommend the best-fit solutions for our clients, based on the balance of available funding and personnel versus desired functionality.

GeoDecisions is ISO 9001:2008-certified and employs more than 80 IT and geographic information system (GIS) professionals operating out of 9 offices. Our staff is engaged in IT consulting and in the design, development, and deployment of data repositories and geospatial and Web-enabled information management systems. GeoDecisions IT solutions are flexible, scalable, and resusable.

Our business specialties benefit the logistics and fleet management, insurance and financial, municipal and facility asset management, transportation, and utility markets.

Our team includes subject matter experts with advanced certifications who keep their fingers on the pulse of geospatial technology. Through industry leadership, ongoing training, and a unique blend of talent, GeoDecisions professionals work to exceed client expectations every day. Our vision identifies and mitigates risk, resulting in more effective project collaboration, on-time delivery, and success.

VESTRA

5300 Aviation Drive, Redding, CA 96002
Phone: (530) 223-2585
MBraghin@Vestra.com

As a leader in GIS/IT, Environmental Solutions, Engineering, and Surveying, VESTRA has the depth of know-how and experience to help clients achieve success. VESTRA, an employee-owned corporation dating back to 1988, prides itself on our local presence and commitment to the community. Our mission is to be our clients' most-valued consultant by providing cost-effective, innovative, and technically superior project solutions. Whatever your current or future needs, VESTRA's full-service resources are available to support you on your next critical project.

RFP Distribution

URISA members, remember that URISA will distribute your RFP/RFQ announcements to our corporate and business members at no charge. Simply email your announcement to **info@urisa.org** (Subject: RFP Service) and we'll send it right out for you!

2018 Partner Directory

WELCOME NEW BUSINESS PARTNER

AmigoCloud

Based in San Francisco with an additional location in Lima, Peru, AmigoCloud was founded by a team of GIS experts in 2013 to empower companies and individuals to collect, manage, visualize, and analyze location data to better understand their business and reveal and hidden patterns to reduce costs and increase operational efficiency.

AmigoCloud has developed the first Collaborative Mapping Platform, offering two products, amigoCollect and amigoPlatform. amigoCollect is a mobile application, built for Android and iOS devices, that helps your field crew collect data, whether online or offline, and collaborate with as many people as your team needs.

With a streamlined and quick workflow, you can collect, storage, transform, enrich, visualize, and analyze data as well as easily create, embed, and publish meaningful maps. We reduce, and in some cases completely eliminate, mapping workflows that would normally take several days or weeks. Our software is designed to require no GIS training or any other kind of specialized hardware.

amigoPlatform enables companies to build a custom mapping solution, analyze big location data and real-time data, even a petabyte scale, and add location intelligence to your own software.

A powerful enterprise-ready platform to manage from remote sensing data and satellite imagery to Internet of Things data coming from sensors.

Applied Ecology, Inc.

Located in Brevard County, Applied Ecology is knowledgeable and experienced in working with clients in the central and south Florida area. Our location has allowed us to be highly involved in the Indian River Lagoon TDML process, and preserving some of the most precious natural resources of the Tampa Bay and Indian River Lagoon estuaries. We serve municipalities and other businesses that cater to public clients and are experts in their fields. Applied Ecology, Inc. is a small, woman-owned business with 40 years of combined specialized experience in:

- GIS
- Remote sensing
- Project management
- Complex data and database management
- Statistical analyses
- Software tool development

We focus on serving public clients in:

- Environmental resource management
- Ecological studies
- Water resources
- Stormwater management
- Utilities

AEI has the experience and skills to plan studies that cross multiple disciplines. Please see the key staff qualifications and project examples to see the level of expertise a small team

- Data management
- Custom programming
- Database creation
- High-level spatial and statistical analyses
- Report writing

We take pride in being a highly responsive business that delivers quality products on-time!

Infrastructure Mapping and Autonomy

We leverage technology developed by our autonomous vehicle mapping partner for rapid LiDAR processing and map production.

Infrastructure Mapping and Autonomy was created out of the Heavy Industry of Civil Maps an industry-leading artificial intelligence company, providing LiDAR processing and feature extraction services. Our technology was first developed to meet the high accuracy, 3D mapping needs of the autonomous vehicle industry. IMA is now bringing this technology to the engineering and infrastructure industries.

Our technology allows us to scan, map and report on assets or asset areas at a rapid pace and affordable cost not possible before. Leveraging our proprietary artificial intelligence, patented cloud based processing technology, and global relationships for LiDAR collection and processing and quality control, we can generate data sets, models and change detection reports 10x faster than with traditional methods.

By creating HD 3D maps in the earliest stages of projects, our clients are able to increase the NVP of projects by lowering the time to completion and reducing and deferring survey programs until the later stages of a project. Additionally, clients with existing assets to manage benefit from our centralized on-line business-to-business services to manage their rapid feature extraction and mapping programs. Eliminating the inefficient traditional person to person sales and manual data handling processes. Our al-a-carte on-line tools allow asset owners to individually direct and manage their mapping projects, resulting in quicker turnaround times and lower costs overall.

2018 Partner Directory

MGP

701 Lee Street Suite 1020
Des Plaines, IL 60016
Tel: (847) 656-5698
info@mgpinc.com
www.mgpinc.com

MGP is an information systems services company that specializes in geo-spatial solutions. Our comprehensive range of geographic, data modeling, and business process solutions provide you new opportunities to find a better way. We believe that innovation creates opportunity and collaboration breeds success. MGP was formed as a shared business model in which clients are partners. This philosophy enables significant cost savings and makes it possible for any client, regardless of size, to get where they need to go. MGP is the managing partner of the GIS Consortium.

Planning Communities, LLC

9131 Anson Way, Suite 304
Raleigh, North Carolina 27615
919-803-6862 (Office)
919-882-1206 (Fax)
contactus@planningcommunities.com
ttownsend@planningcommunities.com

Planning Communities, LLC provides a wide range of multi-disciplinary planning services for local, state and federal agencies, tribal nations and community organizations. Community, transportation, environmental and GIS services include local/regional planning, visioning/scenario planning, land use, socioeconomic, market and cost-benefit analysis, community asset mapping, tool/application support and development, process improvement/integration, consensus-building and facilitation.

Headquartered in Raleigh, North Carolina, Planning Communities has additional offices in Charlotte (NC) and Seattle (WA). Planning Communities is a North Carolina certified Small Professional Service Firm (SPSF) and is certified as a DBE in North Carolina, Tennessee, Florida and Delaware.

Solv3D, Inc.

Solv3D creates tools that enable people to effectively use large 3D point clouds and immersive imagery within their existing workflows. Using the 3DPointLogic™ toolkit, individuals can easily turn massive point clouds into manageable data sets. With the SiteVisit360™ collaborative platform, companies can merge 3D point cloud data, panoramic imagery and other photography, resulting in a virtual project environment, allowing them to more effectively leverage the value of their datasets for estimation, planning, design, and decision-making.

Spatial Relationships, LLC

800 Boylston St #990756
Boston MA 02199
(857) 400-8920

Contact:
Kathryn Brewer
James Armstrong

Spatial Relationships, LLC is a consulting firm that provides on-demand teams of expert Geospatial Professionals to ensure organizations have the capability to deliver on existing and future goals, manage business risk, and increase profitability.

Think of us as your geospatial concierge. Our "concierge services" provide resources and solutions for planned or abrupt disruptions as well as future projects. These can include:

- Being a key person down – planned leave or unexpected departure
- Technical requirements – fill skills, knowledge and training gaps
- Budget constraints – less than anticipated funds for the same scope of work
- Capacity constraints – completing urgent priorities for overbooked staff

Spatial Relationships, LLC was born out of the necessity to create new flexible and affordable ways to work that support organizations to manage ever-increasing demands as well as the need to support the community of Geospatial Professionals.

Educational Institution Members

Brandman University

Brandman University is a private, non-profit regionally accredited institution that provides educational opportunities for working adults. There are over 25 campuses throughout California and Washington, and a virtual campus online.

Undergraduate Certificate, GIS Use in Non-Profit Organizations - An innovative, problem-solving approach to learning and using GIS.

Kent State University

The online Geographic Information Science (GISc) programs from Kent State University offer you the skills and knowledge to delve into exciting and evolving areas within GISc. With the increasing demand for GISc expertise, graduates of the GISc program can drive innovation and apply modern technologies to their careers in non-profit, government or business sectors.

Online Master of Geographic Information Science

Online Geographic Information Science Certificate

Lakeland Community College — Kirtland, OH

- Geography and Geospatial Technology - Associate of Applied Science and certificate programs

North Carolina State University - Center for Geospatial Analysis

- Master of Geospatial Information Science and Technology (MGIST)
- Graduate Certificate in Geospatial Information Science (GIS)

USC Spatial Sciences Institute

Roster of Academic Programs:

- B.S. in GeoDesign
- Spatial Studies minor
- Human Security and Geospatial Intelligence minor
- Online Graduate Programs in Geographic Information Science and Technology
- Graduate Certificate in Geographic Information Science and Technology
- Graduate Certificate in Geospatial Leadership
- Graduate Certificate in Geospatial Intelligence
- M.S. in Geographic Information Science and Technology
- M.S. in Spatial Informatics
- Ph.D. in Population, Health and Place

Mark Your Calendar!

October 9-12, 2018
GIS-Pro & CalGIS 2018
Palm Springs, California

December 3-7, 2018
URISA GIS Leadership Academy
Austin, Texas

February 25-28, 2019
2019 GIS/CAMA Technologies
Conference
Portland, Oregon

May 20-24, 2019
URISA GIS Leadership Academy
Raleigh, North Carolina

August 19-23, 2019
URISA GIS Leadership Academy
Toronto, Ontario Canada

**September 28-
October 2, 2019**
GIS-Pro 2019: URISA's 57th Annual
Conference for GIS Professionals
New Orleans, Louisiana

PRESIDENT
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Communities,LLC (Raleigh, NC)
ttownsend@planningcommunities.com

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tcorbin@egisassociates.com

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ccgis@ccgisonline.com

SECRETARY
Bryan Townsend, GISP – York County, SC
bryan.townsend@yorkcountygov.com

James Armstrong, AICP, GISP — Spatial
Relationships (Boston, MA)
jamesa@spatial-relationships.com

Keri Brennan, GISP —Michael Baker Intl.
(Indianapolis, IN)
kbrennangisp@gmail.com

Lynn Dupont, GISP – Regional Planning
Commission (New Orleans, LA)
ldupont@norpc.org

Corey Halford, GISP — City of Airdrie (Alberta
Canada)
Corey.Halford@airdrie.ca

Brent Jones, PE, PLS — Esri (Vienna, VA)
bjones@esri.com

Robert (Robb) Kirkman, GISP — Metro
(Portland, OR)
robert.kirkman@oregonmetro.gov

Michael (Glenn) O'Grady—Planning
Commission (Encinitas, CA)
mgogrady@interserv.com

*CHAPTER ADVISORY BOARD
REPRESENTATIVE (NONVOTING):*
Cindy Post, GISP—City of Leduc (Alberta Canada)
CPost@leduc.ca

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A publication of URISA

URISA
701 Lee Street, Suite 680
Des Plaines, IL 60016
Phone (847) 824-6300
Fax (847) 824-6363
info@urisa.org
www.urisa.org

Submissions
Editor – Judy Colby-George, AICP, Spatial Alternatives, Yarmouth, ME
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See you there!