"Focusing on education, research, and development of technology to sense and understand natural and manmade environments."

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Prepared By:

Michigan Tech Research Institute

and

Integrated Global Dimensions

Michigan Technological University

& Integrated Global Dimensions

Characterization of Unpaved Road Condition Through the Use of Remote Sensing Project

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Authors:
Valerie Lefler, valerie@igdinaction.com
Colin Brooks, cnbrooks@mtu.edu
Richard Dobson, rjdobson@mtu.edu

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Section I: Introduction

This report describes the outreach activities by the project team during Phase II of the "Characterization of Unpaved Road Condition Through the Use of Remote Sensing Project". These outreach activities served as both an outreach component and to assist in implementation and commercialization efforts. For these efforts, Michigan Tech Research Institute worked closely with Integrated Global Dimensions (IGD), as IGD staff specialize in transportation related outreach activities.

Numerous outreach activities were engaged to encourage the public and private sector to adopt the technology developed as part of the project. Various platforms were used to engage the audience during the course of this phase of the project. Online engagement included creating several videos, an online webinar, uploading the slides to SlideShare, and uploading images to a photo sharing website. In addition, the technical field demonstrations were designed to encourage adoption of the technology and discover pain points the technology can address.

The outreach activities complimented each other – such that when recruiting for the technical demonstrations, potential participants could review material to decide if there was potential and we were able to use the outreach activities to further enhance the online reference materials.

Adoption of the technology is in progress and there are several interested agencies and organizations looking to utilize the system. However, many agencies are in "wait and see" mode regarding the final regulations, rules, and local politics relative to privacy, security, etc. prior to true adoption.

Section II: Branding

One of the first items of business as part of the outreach was to give the platform a name and a brand such that people could easily identify the platform and technology. One of the key aspects for naming the system is being able to use it in standard sentences such as:

- Did you see the _____?
- I would like to buy the _____.
- I need to get one of those _____.
- I was looking at the _____.

While not "mind blowing" or "rocket science", the challenge is that often in academia and research and development (R&D), the name of the system becomes non-germane and they cannot remember it. When IGD started working with the MTRI project team the name of the system was:

URCAS: Unpaved Road Condition Assessment System

The problem with URCAS was many individuals did not know if the vowels in the acronym were strong or soft and when used in the sentences listed above it created some interesting variations that were not identifiable or meaningful. Thus we went through the process of naming the system working with the project team and identifying commonly used terms that were words we could turn into the new project team that had meaning and was easy to say. After 2-3 revisions, the final option was selected, with input from the project's Technical Advisory Committee (TAC).

AURA: Aerial Unpaved Road Assessment system

The MTRI project team also worked to develop a logo that could identify the project as well as tied back to the University – so we utilized the Michigan Tech colors of deep yellow and black (Figure 1).

Figure 1: The newly designed AURA logo.

Section III: Online Channels of Outreach

Being able to engage an audience visually through online portals to reduce travel time and encourage self-discovery was a major focus for this project. Our target audience for the AURA system in public agencies typically have very small travel budgets, thus being able to learn about the system remotely was incredibly valuable in reaching the largest audience possible.

We utilized a variety of modes of traditional and non-traditional online outreach – including a YouTube Channel, 2 traditional Webinars, Slide Share, and SmugMug (photo sharing site). Early in the project we experienced several issues related to state DOTs not being able to use social media outlets like YouTube or SlideShare due to security walls in the agency, however, as FHWA and other federal agencies began to distribute more and more information in this manner the restrictions on such channels reduced dramatically.

Metrics for each of the methods of outreach was important to the project to really determine how many people were engaged and/or how interested are they in the various aspects of the technology.

YouTube:

An AURA YouTube account was created to house various videos that were captured by the project team as well as video captures of the computer monitor manipulating the data. Figure 2 show a screenshot of the channel including five of the videos available for viewing.
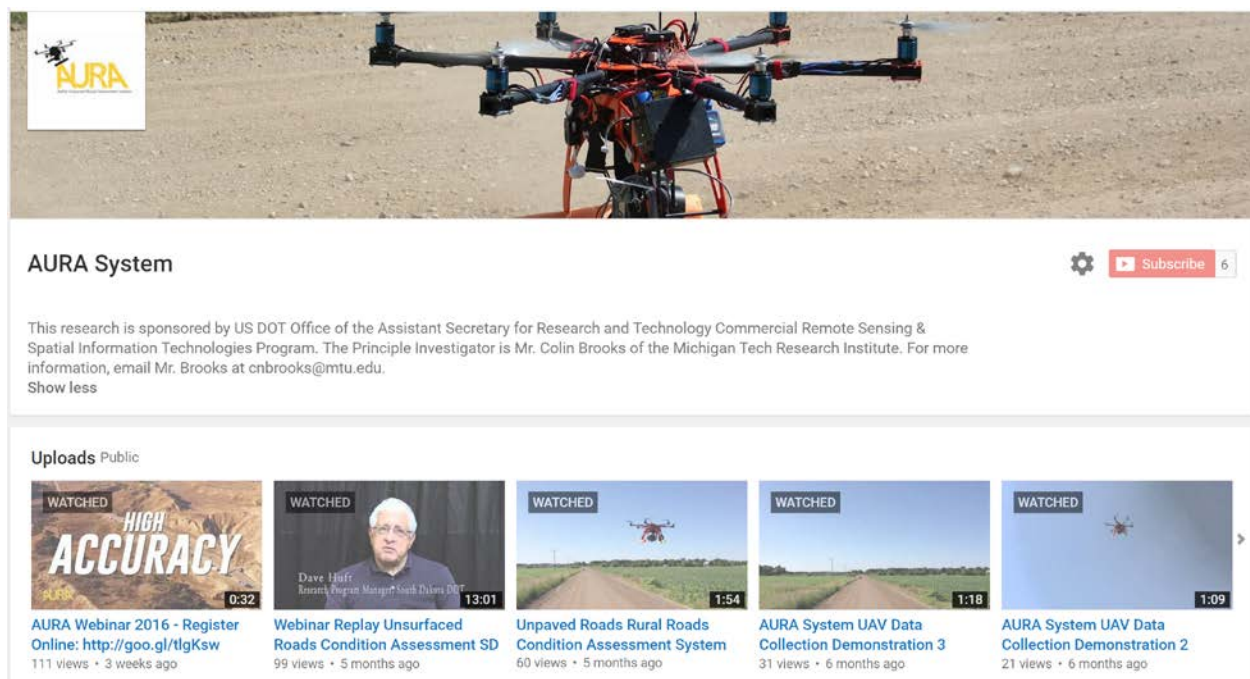

Figure 2: Screenshot of the AURA channel on YouTube.

The project team created 10 different videos during the Phase II outreach: which on the YouTube channel received 427 views, 897 minutes of watch time (almost 15 hours) and the average video watch duration was 2.06 minutes (Figure 3).
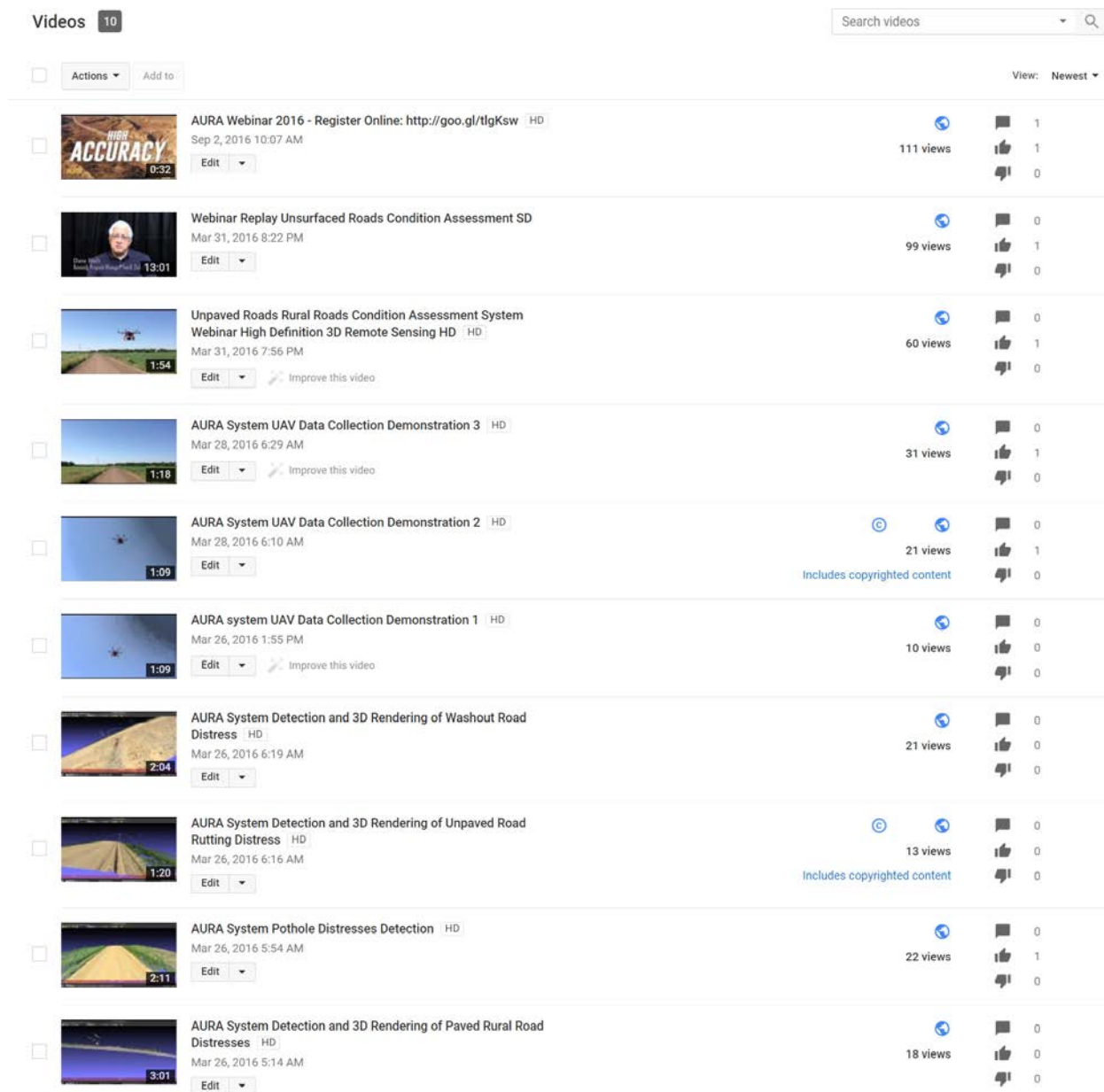
Figure 3: A screenshot of all the available videos on the AURA YouTube channel.

In reviewing the metrics from the videos that were uploaded on the system, the Webinar Replay from the Evergreen Webinar was the most watched by far with a total of 597 minutes. The webinar utilized in the Evergreen format during the Phase I outreach was more of a motion picture with several different speakers, visuals, and music arrangements that totaled about 15 minutes in length. The remaining videos which averaged less than 100 minutes watched were predominately flat without narration and specific speakers. Figure 4 displays the breakdown of the "Watch Time" and "Views" each of the videos has received.

Figure 4: A screenshot of the viewing statistics of the AURA channel.

In addition, the geography and user base was able to be captured in the analytics, where we could see about 87% of the interest was domestic, with some interest in Canada, Brazil, Australia, and South Africa. Audience demographics could be captured as well, through individuals who watched the video while they were logged into a social media or other platform that the YouTube analytics could capture (Figure 5).

Figure 5: A breakdown of the geographic distribution of the viewers (left) and the their gender (right).

When drilling down into the domestic states that are interested in the technology based upon video viewership the following states were the most engaged. Figure 6 displays a breakdown of the viewers by state and includes Watch Time, Views, and Average View Duration. Arizona, Nebraska, Kansas, and Texas all had over 50 minutes of watch time on the videos. Most of the views however were generated in Nebraska with 75 and the next highest viewing state was Kansas with 30 views. Viewers form Mississippi had the highest average view duration with over five minutes learning about the AURA system.

Geography	Watch time (minutes) ↓	Views	Average view duration
Arizona	86 (11%)	28 (7.6%)	3:03
Nebraska	84 (11%)	75 (20%)	1:07
Kansas	72 (9.2%)	30 (8.2%)	2:24
Texas	50 (6.4%)	18 (4.9%)	2:46
Oklahoma	45 (5.7%)	11 (3.0%)	4:02
Iowa	44 (5.7%)	27 (7.4%)	1:38
Colorado	36 (4.6%)	12 (3.3%)	2:59
Minnesota	36 (4.6%)	9 (2.5%)	3:58
Mississippi	29 (3.7%)	5 (1.4%)	5:50

Figure 6: A breakdown of the AURA channel video views by state.

Another interesting aspect to the AURA YouTube channel was that the majority of the viewership resulted at a computer vs. a smart phone or tablet. Thus generally speaking they are learning about the system while at work during the business day (Figure 7).

Device type	Watch time (minutes) ↓	Views
☐ Computer	720 (92%)	324 (88%)
☐ Mobile phone	47 (6.0%)	33 (9.0%)
☐ Tablet	14 (1.8%)	10 (2.7%)

Figure 7: A breakdown of the type of device used to view AURA videos.

SlideShare

As part of the outreach the project team also uploaded three of the PowerPoint presentations from the technical demonstration for the 30th Annual Region Local Road Conference and was able to see significant traction with almost 1,000 views of the presentation outside of that one time in the conference meeting room. In total it took less than 20 minutes to upload the presentations and for the extension of 812 direct additional views of the information is very powerful and an amazing return on investment for the project team and faculty. Figure 8 shows a screenshot of the presentations the project team has made available through SlideShare.
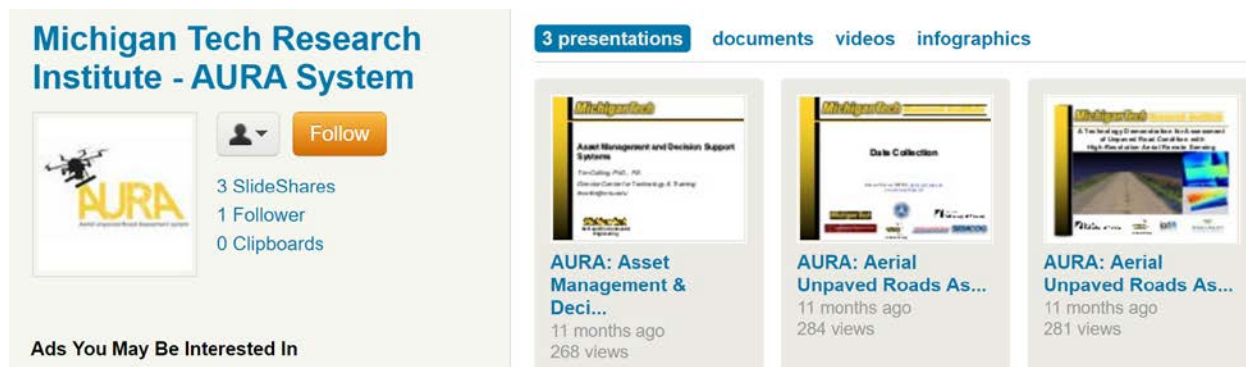
Figure 8: Screenshot of the presentation available through SlideShare.

The viewership of SlideShare was also dramatically domestic, with over 500 views (Figure 9). Internationally, the next most engaged country was France, then the Netherlands. So the information that was presented at the conference in October 2015 was able to extend even internationally with just a few minutes of time invested.

Figure 9: Screenshot of the total views of each presentation (left) and by country (right).

SmugMug – Photo Sharing Site

A picture is truly worth a 1,000 words when describing research and sharing information. As part of this outreach the project team created a photosharing website using SmugMug. SmugMug allows for branding of the photo site as well as captures metrics related to views. It is more of a business sharing site than a social media outlet such as Flickr. We created 17 albums containing 612 images in total for workshop participants or online viewers to access and share with colleagues and co-workers (Figure 10).
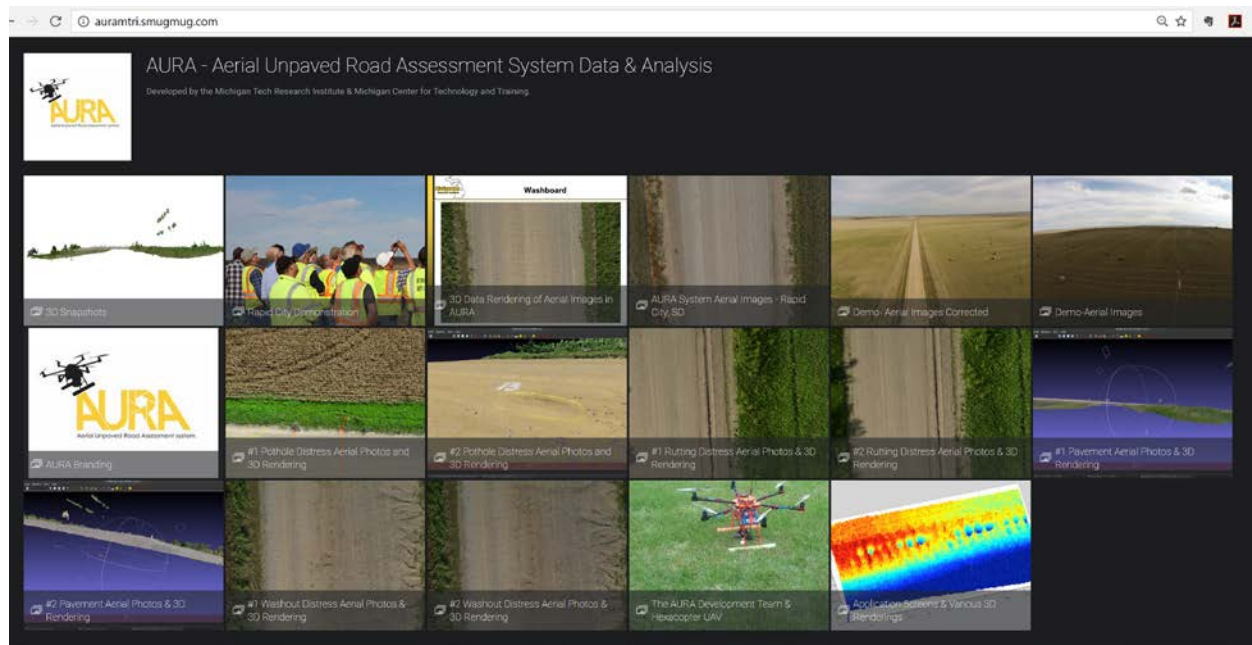
Figure 10: Screenshot of the AURA SmugMug photo sharing webpage.

Overall the viewership statistics are not as detailed as the YouTube channel but in total there were 7,618 views on the photo sharing site (Figure 11), the most of our social media promotion efforts. Many spikes in activity were directly related to when technical demonstrations were held as well as follow-up outreach and advertising for the in-person webinars. Figure 12 also shows that the folder "Rapid City Demonstration" is the most popular folder with 3,944 views as of September 29, 2016.
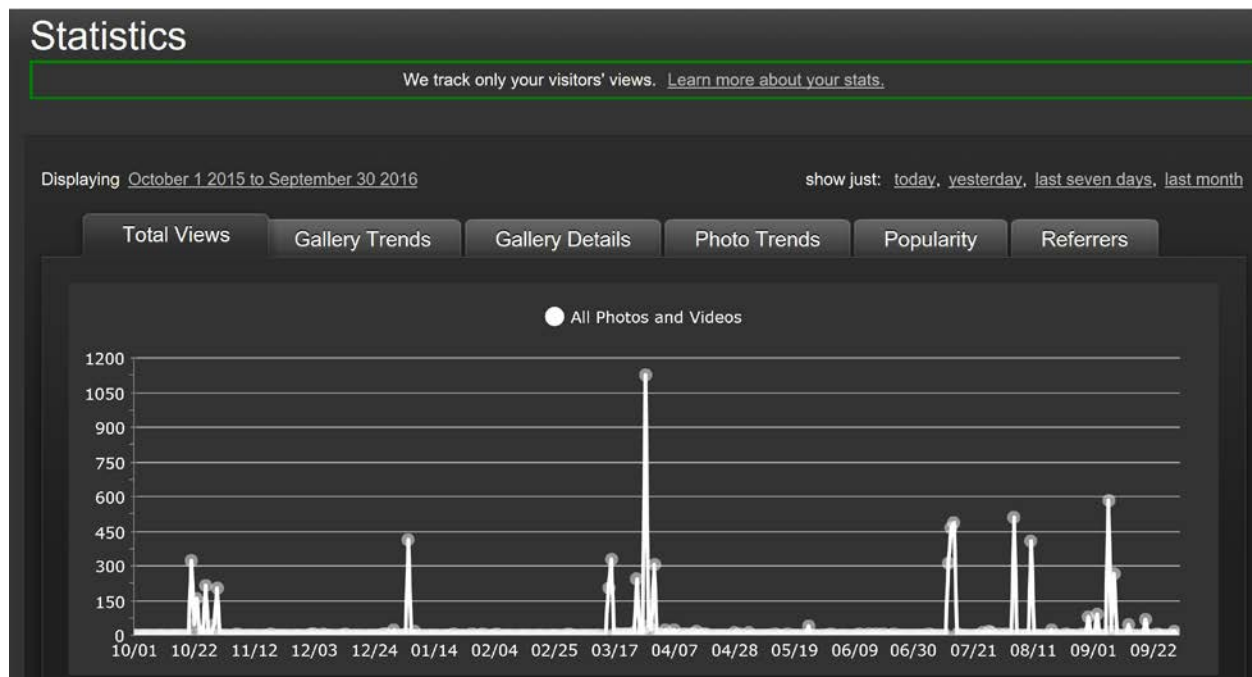
Figure 11: Screenshot of the viewing statistics from SmugMug.
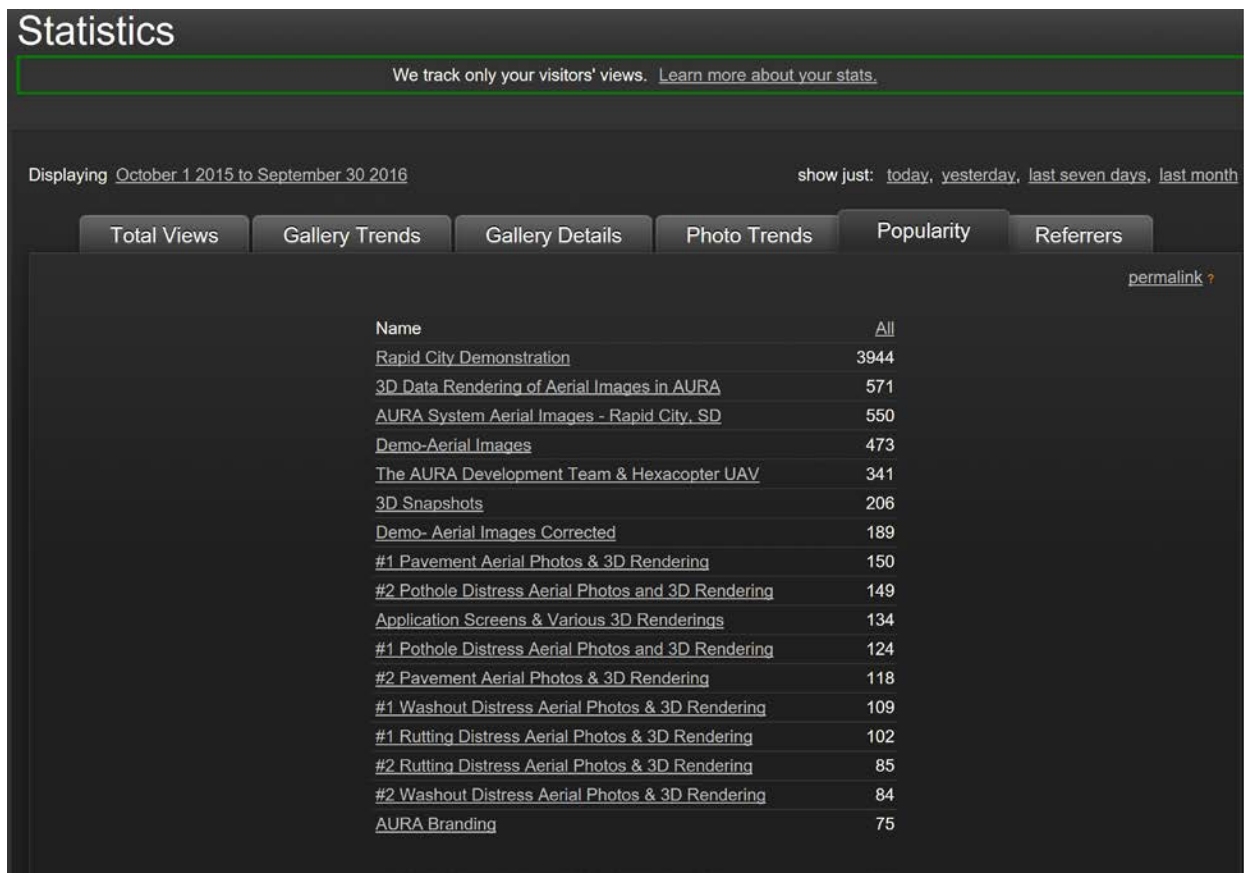
Figure 12: Screenshot of the views by folder on the SmugMug website.

Live Webinar & Email Marketing:

IGD also facilitated two live webinars that were held on September 8 and September 22, 2016 led by the PI, Mr. Colin Brooks. To encourage attendance at the webinar, IGD sent out an email announcement to 9,737 domestic and international transportation professionals on our proprietary listserv.

Key aspects of the design of the email to recruit participants were taken into account:

1) Not overly formal – research has a reputation of being very dry when presented online and we wanted to present a fresh, engaging tone to the language in the email.

2) Placement of a video to recruit individuals to the webinar had to be prominent and easily clickable such that clicking on the video with a smartphone view was easily accomplished.

3) Numerous opportunities to engage with the online content were made available to access the video channel, pictures, etc. with clickable links vs. the long URL that just give readers a headache and it looks sloppy. The other benefit was that even if they were not interested in a full hour webinar, or the dates didn't work in their schedule, they were able to access the information to learn more – thus driving traffic to the social media sites.

There is an art to designing an attractive engaging email and it is shown in Figure 13.

AURA - Latest Technology in Drone Asset Management - Webinar Registration - Space is Limited
Sent Tuesday, September 6, 2016
View as plaintext

Good morning,

We're excited to announce that we're holding a new webinar to discuss the advancements in our Aerial Unpaved Road Assessment (AURA) Technology and how you can finally access it for your organization. (check out the promo video below!)

AURA has evolved over the past 4 years and we're excited to share with you:

- our most recent updates to the platform and technology
- new changes in the FAA regulations that will *make it easier* **
- how you can gain access to the technology and equipment for your organization

The webinar is being held September 8, 2016 at 2 PM EDT and if that date does not work in your schedule, we are holding a encore presentation September 22 at 2 PM EDT.

This research is sponsored by US DOT Office of the Assistant Secretary for Research and Technology Commercial Remote Sensing & Spatial Information Technologies Program.

If you liked the promo video and want to learn more:

- Please feel free to check out our YouTube Channel to see the system and some of the sample output.

- Additional images can be viewed on our photo-sharing site.

- Read the Field Demonstration Report.

- Read the Commercialization Report

Before the webinar or at any time, if you have any questions about the AURA system, please don't hesitate to contact me.

Best regards,

Colin

Colin Brooks
Senior Research Scientist

Figure 13: The email announcement which was sent out ahead of the September 8, 2016 webinar.

Aweber was used to track how many of the email recipients opened the email as well as tracked how many clicked to learn more about AURA. This service also tracks emails which were forwarded to other individuals and how many were viewed. From the email that went out to the almost 10,000 individuals, there were **1,892 individuals who opened the email** and that in total there were almost 800 clicks to learn more about the information linked in the body of the email.

From the email announcement that was presented, there was significant engagement from DOT officials at Kansas DOT, Nebraska DOR, Florida LTAP, SRF Consulting, Colorado DOT, Texas DOT, Ohio DOT, Gannet Fleming, and Virginia DOT. This definitely defines that there is state DOT interest in the research and in the technology (Figure 14).

Opens
Make segments based on who opened your messages.

		Opened	Unopened

Scott King sking@ksdot.org	109 Opens	19 Clicks	$0 in sales
Fouad Jaber fouad.jaber@nebraska.gov	89 Opens	14 Clicks	$0 in sales
Nina Barker nbarker@ufl.edu	72 Opens	2 Clicks	$0 in sales
Scott Brian bscott@srfconsulting.com	60 Opens	16 Clicks	$0 in sales
Garry Warren garry.warren@arrb.com.au	58 Opens	25 Clicks	$0 in sales
Miller, Gregg gregg.miller@dot.state.co.us	46 Opens	7 Clicks	$0 in sales
Morgan Curtis c-morgan@ttimail.tamu.edu	40 Opens	1 Click	$0 in sales
Coyle, David david.coyle@dot.state.oh.us	36 Opens	15 Clicks	$0 in sales
Rusty James wjames@gfnet.com	36 Opens	8 Clicks	$0 in sales
Brian Bruckno brian.bruckno@vdot.virginia.gov	34 Opens	6 Clicks	$0 in sales

Figure 14: A breakdown of how many emails were opened and links clicked.

There were 60 individuals from over 20 states/countries who registered for the webinar. Between both days, there were 33 attendees for the September 8 Webinar and 15 for the September 22 Webinar. Combined there was approximately an 80% attendance retention from those who signed up to those who actually attended the webinar. The list of registrants is listed in Table 1. IGD utilized Go To Meeting as the webinar platform and it does not track the list of attendees in the software, so when a participant would log into the webinar, did not track exactly who it was by name, especially if they used their organization name or initials as the log-in name.

Table 1: A breakdown of the individuals who registered for the webinar.

Name (First)	Name (Last)	Title	Company	Address (City)	Address (State)
Bryan	Cawley	Construction Management Team Leader	FHWA	Washington	DC
Brett	Commander	Principal Engineer	BDI - Bridge Diagnostics, Inc.	Boulder	CO
Greg	Stahr	SkillsUSA State Director	Nebraska Department of Education	Lincoln, NE	NE
Alexandra	Shirk	Research analyst	ATRI		
Rhett	Desselle	Assistant District Administrator, Operations	Louisiana DOTD	Alexandria	LA
Yibo	Zhang	Research Assistant	University of Louisville	Louisville	KY
Clay	Adams	Bureau Chief of Maintenance	Kansas Department of Transportation	Topeka	KS
Ebiri	Nkugba	consultant	Solum Imaging	Grand Rapids	MI
Edward	Chung	Dr	QUT		
Julius	Codjoe	Research Associate	Louisiana State University		
Tom	Swafford	Utility Coordination Program Manager	Utility Mapping Services, Inc.	Duluth	MN
Rusty	James	Incident Management Specialist	Gannett Fleming	Blue Springs	MO
Basak	Bektas	Associate Scientist	InTrans		
Bill	Benson	Project Manager	Gannett Fleming Management Services LLC	Harrisburg	PA
Joseph	Hawkins	Staff Traffic Engineer	Arkansas State Highway & Transportation Department	Little Rock	AR
Brad	Young	Transportation Engineer	Ohio DOT	Columbus	OH
Renee'	Ekhoff	Mrs.	Grand Island Public Schools	AURORA	NE
Collin	Castle	Connected Vehicle Specialist	Michigan DOT	Lansing	MI
Colin	Brooks	Senior Research Scientist	Michigan Technological University - MTRI	Ann Arbor	MI
Bhaven	Naik	Asst Professor	Ohio University	Athens	OH
James	Morin	Mainteance Operations Manager	WSDOT	Olympia	WA

Lekshmy	Sankar	Software mgr	CDOT	Denver	CO
Saeed	Doust	Bridge Designer	BKI	Metairie	LA
Tom	Rhoads	Road Design Leader	Kansas Department of Transportation		
Daniel	Adamczak	Assistant Maintenance Engineer	Alaska Department of Transportation	Fairbanks	AK
Frank	Hollowell	Senior Director, Projects	CG/LA Infrastructure	Washington	DC
Stuart	Lowe	R&D mgr	ARRB		
Fred	Judson	UAS Program Director	Ohio Department of Transportation	Springfield	OH
Brian	Bruckno	Engineering Geologist	VDOT	Staunton	VA
David	Ooten	State Research Engineer	Oklahoma DOT	OKC	OK
M	Swift	Pavement Management Engineer	Oklahoma DOT		
Fouad	Jaber	Assstant State bridge Engineer	Nebraska Department of Roads	Lincoln	NE
Steven	Itagaki	Project Manager	JMD	Chino	CA
Peter	Ferretti	GIS Coordinator / Developer	Baxter & Woodman Inc	Crystal Lake	IL
Joseph	Jenkins	Civil Engineer	Parametrix		
Ryan	Barrett	Special Requirements Engineer	Kansas Department of Transportation		
Dave	Wilbur	Electronics Specialist III	CDOT	Denver	CO
Ujwalkumar	Patil	Faculty Research Associate	UT Arlington	Arlington	TX
Dean	Dusheck	LS	SRF Consulting Group, Inc.	Plymouth	MN
Kwanghee	Won	Research Scholar	University of Nebraska-Omaha	Omaha	NE
Luis	Moratinos	Geomatics manager	Ferrovial	Madrid	
suraj	sawant	Mr	IITR	Roorkee	
Konstantinos	Sourlamtas	Land Surveyor and GIS Engineer	Education		
David	Banach	Assistant Research Scientist	Michigan Tech Research Institute	Canton	MI
Chaz	Weaver	District Materials Engineer	VDOT	Staunton	VA
Ali	Shafikhani	PhD student	UT Arlington	Arlington	TX
SURYA SARAT	CONGRESS	PhD. Student	UNIVERSITY OF TEXAS ARLINGTON	ARLINGTON	TX

CHANDRA					
Chungwook	Sim	Assistant Professor	University of Nebraska-Lincoln	Omaha	NE
Ryan	McNary	Assistant Manager - TMC Operations	Pennsylvania Department of Transportation		
Raja	Shekahran	Pavement Management Program Engineer	VDOT		
Javier	Mahecha	MSc	USP		
Dimitrios	Vaiou	Student	Harokopeio University	Athens	
Dimitrios	Vaiou	Student	Harokopeio University	Athens	
Armin	Krdzevic	Graduated Land Surveyor	Geodet.d.o.o, Sarajevo		
Ben	Hagan	Pavement Design Specialist	Kansas Dept. of Transportation		
Ashle	Stott	GIS Technician	Scotts Bluff County	Gering	NE
Annal	Lannin	Division Manager	Nebraska Department of Aeronautics	Lincoln	NE
Barry	Scheinost	Project Engineer	Nebraska Department of Aeronautics	Lincoln	NE
Ashle	Stott	GIS Technician	Scotts Bluff County	Gering	NE
Dan	Douglas	GIS Coordinator	Hall County GIS	Grand Island	NE

In reviewing the diversity of interest in individuals who signed up both by discipline and background, it is clear we are making progress in expanding awareness of the AURA system nationally and internationally.

Section IV: Outcomes from Outreach

We had significant engagement online in our media channels and also significant "Q&A" during the webinar, but what is really going to come from all of this effort. What is the ROI?

Technology transfer is difficult to put a specific ROI on and it is also almost impossible to track what individuals are sharing with whom verbally. While we were able to measure interest electronically through email marketing data or YouTube webinar stats to some degree. This, however, does not measure the interest in purchasing or truly using the technology.

The project team has been approached by a number of public and private firms in learning more and getting quotes but the politics, regulatory framework, and budget limitations at even the $10,000 price tag for UAV plus camera are cost prohibitive in some cases. We also found that some state DOTs had limitations on funding sources being limited to local universities vs. out of state institutions, so some state agencies may be taking the lessons learned to their local university and see local implementation of the AURA system or even spin off research ideas.

What is apparent is the education about remote sensing technology and the capabilities and utilities of drones in the DOTs at the local roads level and there is definite interest in the technology. We were able to see increased comprehension and even additional research ideas and applications based upon engagement online as well as through the technical demonstrations.

Section V: Conclusion

In total, the professional outreach for the AURA system garnered:

-   10 videos: which received 427 views totaling 897 minutes of watch time in YouTube
-   3 SlideShares of the Presentations: which receive 812 views – 87% domestically
-   17 online photo albums of 612 images: which received 7,618 views
-   1 email blast that went out to 9,737 professionals: which was opened 1,892 times
-   2 webinars: which received 60 registrants and 48 attendees

Having a dedicated professional or member of the research team focusing on the outreach and knowledgeable about marketing and tools of the trade was beneficial in increasing engagement and allowing the research team to focus on the technical nature of the project outcomes. The online marketing and digital revolution has increased the possibilities and capabilities significantly even during the course of this project and will continue to evolve. Taking the work done by the team at MTRI on the AURA system nationally and internationally using online media was the key goal and it can be documented this was done successfully.