CULTURAL HERITAGE PRESERVATION THROUGH SERVICE LEARNING: APPLYING UNMANNED TECHNOLOGIES IN THE BALKANS BRIDGING TECHNICAL AND SOCIAL SCIENCES

Session Chair: Sue Macchiarella, Director, Office of Global Engagement, Embry-Riddle Aeronautical University, Daytona Beach, Florida, USA

AGENDA

- Overview
- RIT Kosovo
- Cultural Heritage without Borders
- Embry-Riddle Aeronautical University
- Q&A
- Discussion and Reflection
- Final thoughts

INTRODUCTION

- Kosovo
- Cultural Heritage Site Documentation

A DAY IN KOSOVO – ROMAN CITY ULPIANA

CULTURAL HERITAGE PRESERVATION THROUGH SERVICE LEARNING: APPLYING UNMANNED TECHNOLOGIES IN THE BALKANS BRIDGING TECHNICAL AND SOCIAL SCIENCE

Panel

Dr. Rachel E. McGinnis, Director, Peace and Conflict Program Assistant Professor, Department of Public Policy and International Relations, RIT-K (A.U.K.), Kosovo

Kaltrina Thaci, Program Manager, Kosovo Foundation for Cultural Heritage without Borders, CHwB Kosovo

Dr. Dan Macchiarella, Professor of Aeronautical Science, Embry-Riddle Aeronautical University, Daytona Beach, FL

EMBRY-RIDDLE AERONAUTICAL UNIVERSITY

EMBRY-RIDDLE AERONAUTICAL UNIVERSITY

- My role?
- How did this magic begin?
  - The boss
  - The trip
  - The meetings
  - Connecting the dots
  - Creating the program
  - Setting off on the adventure

ROCHESTER INSTITUTE OF TECHNOLOGY – KOSOVO

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Peace and Conflict Summer Program 2020

ROCHESTER INSTITUTE OF TECHNOLOGY – KOSOVO

Peace and Conflict Summer Program 2020

RIT Kosovo | PEACE AND CONFLICT SUMMER PROGRAM

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- **The Rochester Institute of Technology (RIT)**
  - **Ranked 104th in National Universities by US World and News**
  - **Third largest producer of undergraduate STEM degrees in the nation – among private universities**
  - **Has multiple global campuses in China, Croatia, Dubai, and the home of the Peace and Conflict program - Kosovo**

ROCHESTER INSTITUTE OF TECHNOLOGY

- Kosovo war ended in 1999 after the NATO intervention,
- Prominent Kosovars sought a way to honor and memorialize the great role the United States played in the conflict.
- After immense discussion, a major donation on behalf of the Union Fund for the Reconstruction of Kosova (UFORK) funded the start-up of the American University Foundation in 2002.
- UFORK fund was the post-war balance of the money raised by the Kosovo diaspora during the 1990s to support the underground "parallel institutions" in Kosovo of the Kosovo government-in-exile, headed by Prime Minister Bujar Bukoshi.
  - Funds represented small donations from tens of thousands of people.
  - Even today, A.U.K is mindful that it was founded by the hard-earned contributions of the people of Kosovo.

RIT Kosovo PEACE AND CONFLICT SUMMER PROGRAM

THE STORY OF RIT-K (AUK)

- Academic Excellence- Achieve recognized academic excellence through an ever-changing teaching and learning environment that best prepares students for the global workforce.
- Research and Innovation – Collaborate to promote excellence in research that supports undergraduate education and innovation with results connected to Kosovo, the region, and/or the global community.
- Resource Management— Maximize the use of human, technological and fiscal resources for financial sustainability.
- Strategic Enrollment Management - Support a diverse and financially sustainable student body from recruitment to completion to employment.

RIT-K (AUK) FOCUS TODAY

- July 2019 10th anniversary of the prestigious **RIT Kosovo (A.U.K) Peace and Conflict Summer Program**
  - 66 Students: 20 students from RIT Kosovo (A.U.K) and 46 students from various US and international universities
  - Students had the opportunity to participate in roundtable discussions with H.E. Ambassador Kosnett – the 5th U.S. Ambassador to Kosovo
  - Students engage with distinguished faculty including, but not limited to (ret.) US Diplomats and (ret.) US Foreign Policy experts.

RIT Kosovo | PEACE AND CONFLICT SUMMER PROGRAM

RIT-K PEACE AND CONFLICT SUMMER PROGRAM – RECENT EXPERIENCE

- RIT Kosovo (A.U.K)'s unique **Summer Program in Peace and Conflict Studies**: June 22-July 24, 2020
- One-week study tour to Albania, Montenegro, Croatia, and Bosnia. Students meet officials and activists, visit historic and recreational areas.
- Returning to Prishtina, students work in Kosovo's 'living laboratory' of history exploring the origin and resolution of armed conflict, reconstruction and institution building at the end of wars.
- Courses are taught by senior civilian and military officials, NGO activists and academics with hands-on experience in the Balkans, Middle East and elsewhere.
- Students meet Kosovo Government senior officials, activists, and senior officials from diplomatic and international missions. They visit historically significant sites in Kosovo, take part in informal late-afternoon seminars on current issues, and participate in workshop/simulations of peace keeping operations.

RIT-K PEACE AND CONFLICT SUMMER PROGRAM 2020

- Refugees, Migrants and Humanitarian Crises
- Humanitarian Intervention and State Building
- Terrorism and Countering Violent Extremism
- Reporting and Documenting Change
- The Balkans and southeast Europe
- Ethics, International Law and Human Rights in conflict zones
- Culture and technology in conflict zones
- Economics of conflict, reconstruction and development

PCS PROGRAM FOCUSES ON

- **Political reporting, policy analysis and planning**
- **managing peace-keeping operations**
- **Ethical dimensions of decision making in peace operation**
- **Negotiating outcomes and employing international humanitarian law**
- **Role-playing based on real-world examples**

- ***Internships and service learning opportunities with the Kosovo government, international missions, and NGOs.***

PCS PROVIDES PRACTICAL TRAINING AND EXPERIENCE

- Today's issues require well-rounded students that think critically across disciplines
  - Environmental Science
  - Border Security
  - Biomedical Engineering
- PCS has historically brought together those in the STEM disciplines to focus on issues that have and continue to impact the global community
- PCS strives to be at the forefront moving forward to of bring together technology driven solutions to current humanitarian issues

RIT Kosovo | PEACE AND CONFLICT SUMMER PROGRAM

BRINGING THE SOCIAL SCIENCE APPLICATION TO ALL MAJORS

CULTURAL HERITAGE WITHOUT BORDERS (CHWB)

Cultural Heritage without Borders (CHwB) Kosovo

- Cultural Heritage without Borders was founded in 1995 as an independent Swedish non-governmental organization to work in the spirit of the 1954 Hague Convention for the protection of cultural property in the event of armed conflicts, natural catastrophes, neglect, poverty or political and social conflicts.

- **CHwB VISION** is that everyone has the right to enjoy, have access to and participate in cultural heritage.

- **CHwB MISSION** is to promote cultural heritage as both a right in itself and a resource. CHwB works with civil society and institutions at all levels to strengthen peace building, sustainable socio-economic and democratic development and the realisation of human rights.

- CHwB Kosovo office has started its mission in 2001 with the project of restoration of 5 kullas (traditional stone dwelling) in western Kosovo financed by European Agency for Reconstruction.

CHWB KOSOVO PROJECTS

- Since 2001, CHwB Kosovo has implemented a lot of projects in the field of conservation, emergency interventions, adaptive reuse, interpretation and management of cultural heritage sites;

Kulla Oda e Junikut, Junik (Before & After)

CHWB KOSOVO PROJECTS

ENGAGING YOUTH THROUGH PRESERVATION

- CHwB Kosova has fostered the idea to engage youngsters in the preservation of cultural heritage through restoration camps and other projects and activities;

- It has developed the Program **"Heritage Lab"**, an educational project aiming to create new opportunities for students of different fields to learn about methods of documentation, preservation, revival and interpretation of cultural heritage through "hands on" practical work and complementary lectures;

RESULTS:

- 9 restoration camps organized so far;
- About 200 students have participated;
- 1 historic mill was restored and adapted;
- 1 conservation and development plan was drafted for a village;
- 1 kulla (vernacular dwelling) was restored and adapted;
- 1 bridge was regenerated through art;
- 2 cinemas were either interpreted or partially adapted;
- 1 interpretation plan developed for a castle.

ENGAGING YOUTH THROUGH PRESERVATION

CHWB KOSOVA AND EMBRY RIDDLE AERONAUTICAL UNIVERSITY

- For 2 years CHwB Kosova and Embry Riddle Aeronautical University have developed the project of documenting cultural heritage sites in Kosovo through 3D photogrammetry;

- So far **11 historic cores of cities and villages in Kosovo**, such as: Gjakova, Janjeva, Novoberda, Dranoc, Prizren, Mining Settlement in Stanterg, Mushnikova, Junik, Isniq, Ulpiana and Prishtina have been documented through photogrammetry.

The importance of documentation of cultural heritage through 3d photogrammetry lies into:

- Controlling the new developments in their setting;
- Evaluating the new building permit applications in the context of cultural heritage sites;
- Observing the architectural composition of buildings;
- Observing the current physical state of historic sites.

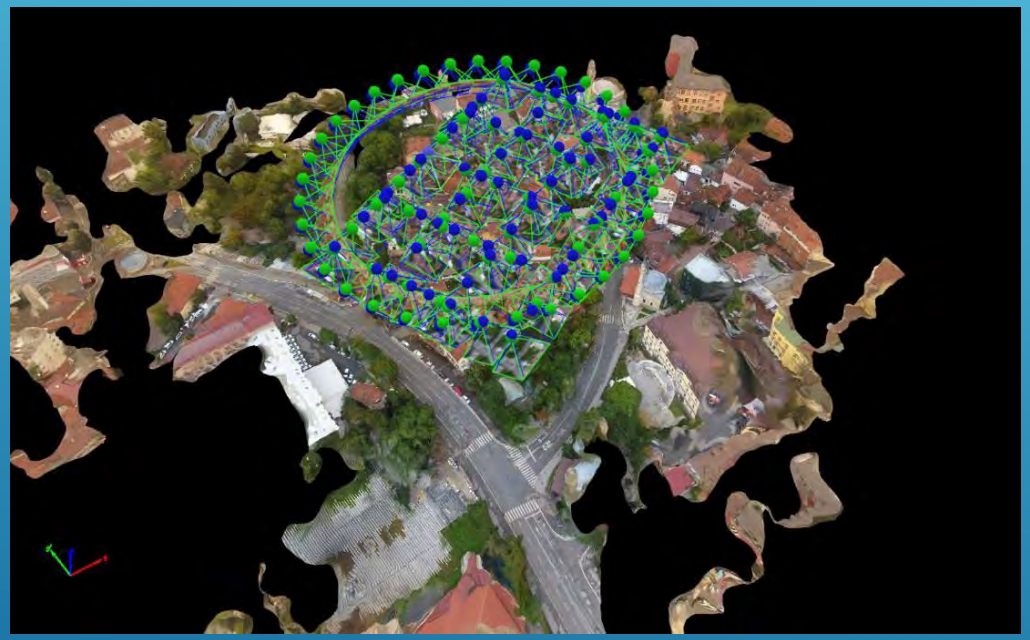
Local authorities and ministries have been provided with final pictures that came out the project.

CHWB KOSOVA AND EMBRY RIDDLE AERONAUTICAL UNIVERSITY

USE OF 3D PHOTOGRAMETRY IN THE REGENERATION OF A HISTORIC ROAD

- In 2018 students from the Embry Riddle University and the staff of CHwB Kosovo documented a historic road in Prishtina through 3D photogrammetry;
- This documentation served to identify the problems the road was facing, the proximity of buildings and the possibilities of its regeneration;
- Since the buildings were quite close to each other, it was very difficult to draw the facades only by measurements, thus the photogrammetry served also as a tool to present the drawings;
- The project of the regeneration of the historic road in Prishtina has been completed and is about to start its implementation.

USE OF 3D PHOTOGRAMETRY IN THE REGENERATION OF A HISTORIC ROAD



THE REGENERATION OF THE HISTORIC ROAD

EMBRY-RIDDLE AERONAUTICAL UNIVERSITY STUDY ABROAD

EMBRY-RIDDLE AERONAUTICAL UNVERSITY IN KOSOV0

- Briefly - UAS Flight Operations and Photogrammetry
- Pedagogy of an effective program
- Partnering
  - Application to Meet Needs
    - Cultural Heritage Site Documentation
- Preparation
- Future Possibilities

INTRODUCTION

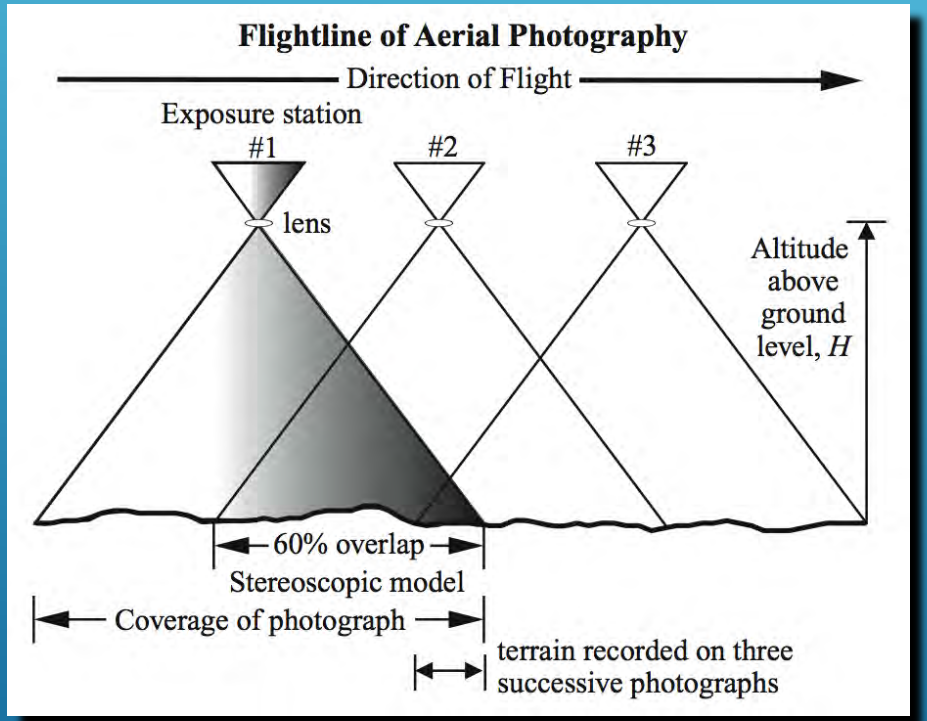
In Kosovo, during summer terms, faculty and students completed academic course work and UAS flight operations.

- **Purpose:**
  - Gather imagery
  - **Develop three dimensional (3D) virtual objects** and **two dimensional (2D) orthomosaic maps**
  - Aid with inspecting, documenting and chronicling locations
- **Why:**
  - Assist with cultural heritage preservation in Kosovo
  - Bring STEM Education to Kosovo
    - Effort funded, in part, by U.S. Embassy Kosovo

Service Learning

UAS FLIGHT OPERATIONS AND PHOTOGRAMMETRY

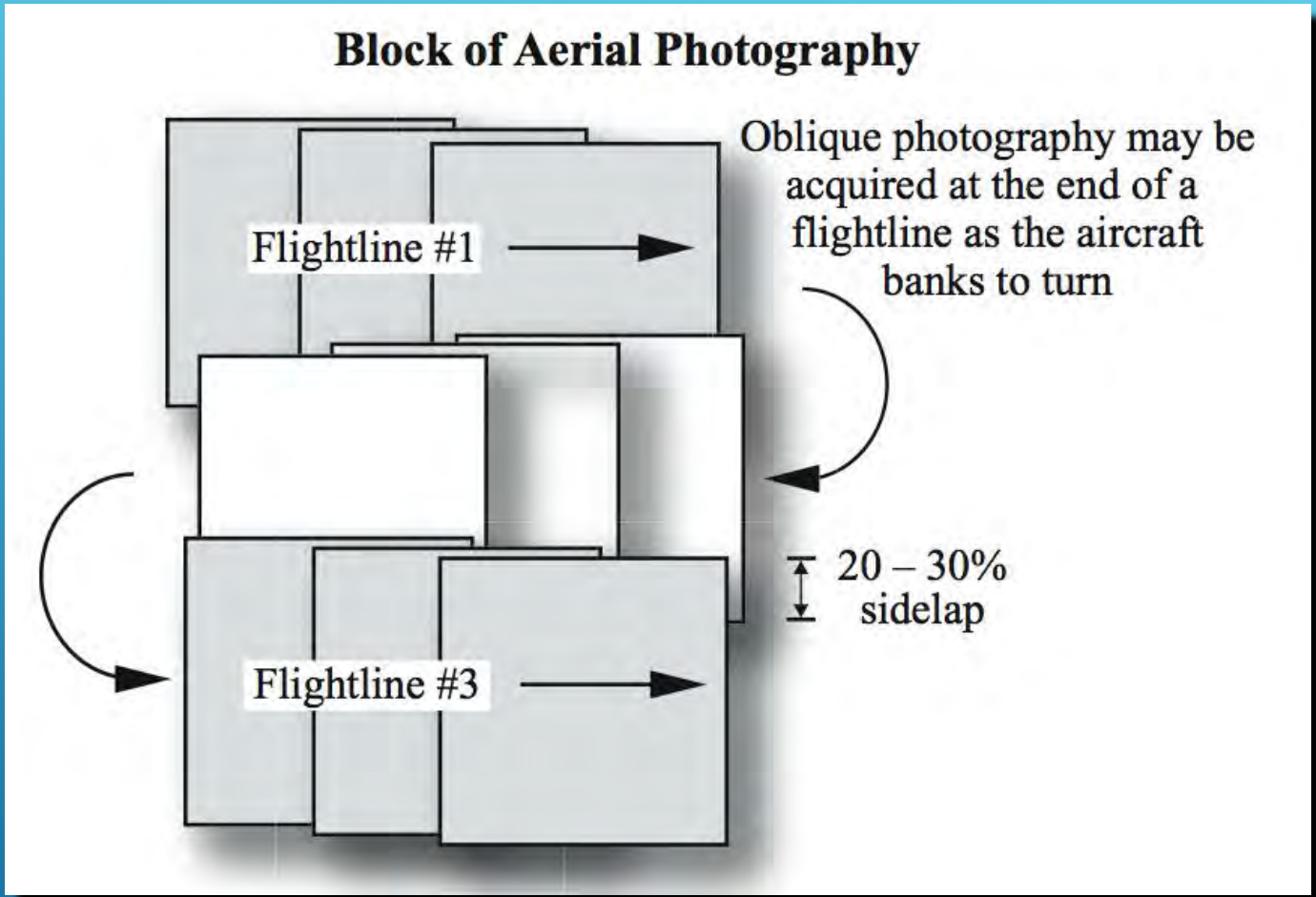
The basic premise of photogrammetry is the art and science of obtaining useful information from the environment by processing imagery and then applying exacting measures that can provide 3D characteristics.



Jensen, 2009

Flight path for aerial photography with end overlap to provide parallactic perspective of pixels to be recognized as a keypoint.

UAS FLIGHT OPERATIONS AND PHOTOGRAMMETRY



Jensen, 2009

Flight path for aerial photography with side overlap to provide parallactic perspective of pixels to recognized as a keypoint.

UAS FLIGHT OPERATIONS AND PHOTOGRAMMETRY

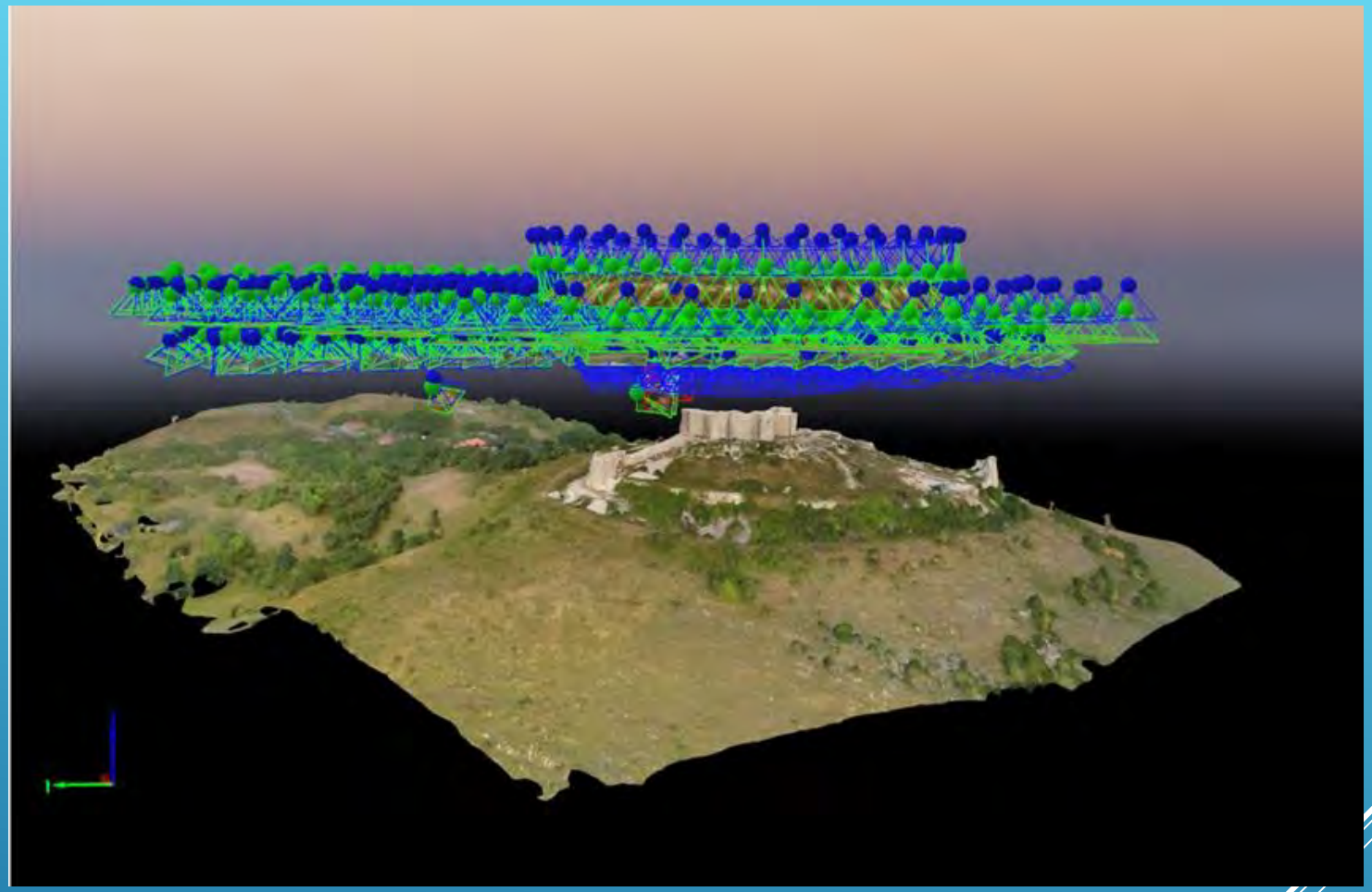
- Equipment
  - DJI Phantom 4
  - DJI Inspire
  - DJI Mavic 2 Pro
  - eBee
- Software
  - Pix4Dmapper Pro
  - Pix4Dcapture
  - DJI GO
  - Blue Marble Global Mapper

- Photogrammetric software identifies keypoints among overlapping images and enables development of virtual objects.
- Photogrammetric software calculates parallactic displacement of recognized key points and then assigns x, y and z values to identified pixels. These pixels serve as the basis for triangle mesh development and refinement as 3D virtual objects.

(CNET, 2019)

UAS FLIGHT OPERATIONS AND PHOTOGRAMMETRY

Camera Points



UAS FLIGHT OPS AND PHOTOGRAMMETRY

PEDAGOGY

- **MSA 533, Unmanned Aerospace Systems -3hr**
- **AS 390, Application of UAS Technology -3hr**
- **AS 399, UAS Photogrammetry for Site Survey -3hr**
- **GCS 304, Political Violence and Terrorism -3hr**
  (upper-level social sciences elective)

PEDAGOGY

- Experiential learning theory (ELT) (Kolb, 1984)
  - Educational theory, a process through which students develop knowledge, skills, and abilities from direct experiences.
- Service Learning
  - Addresses a need in the community (campus, local, regional, global)
  - Meets one or more course objectives
  - Demonstrates a clear connection between the service activity and the course content
  - Involves reciprocity between course and community that results in students' increased civic awareness and engagement
  - Involves structured student reflection
  - Involves collaboration with an appropriate agency representative

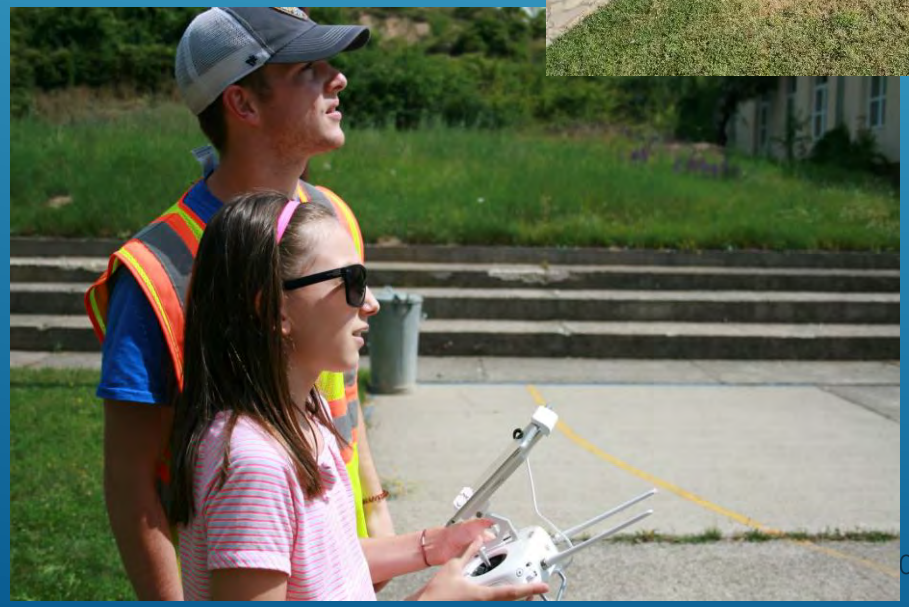
PARTNERS ON THE TABLE

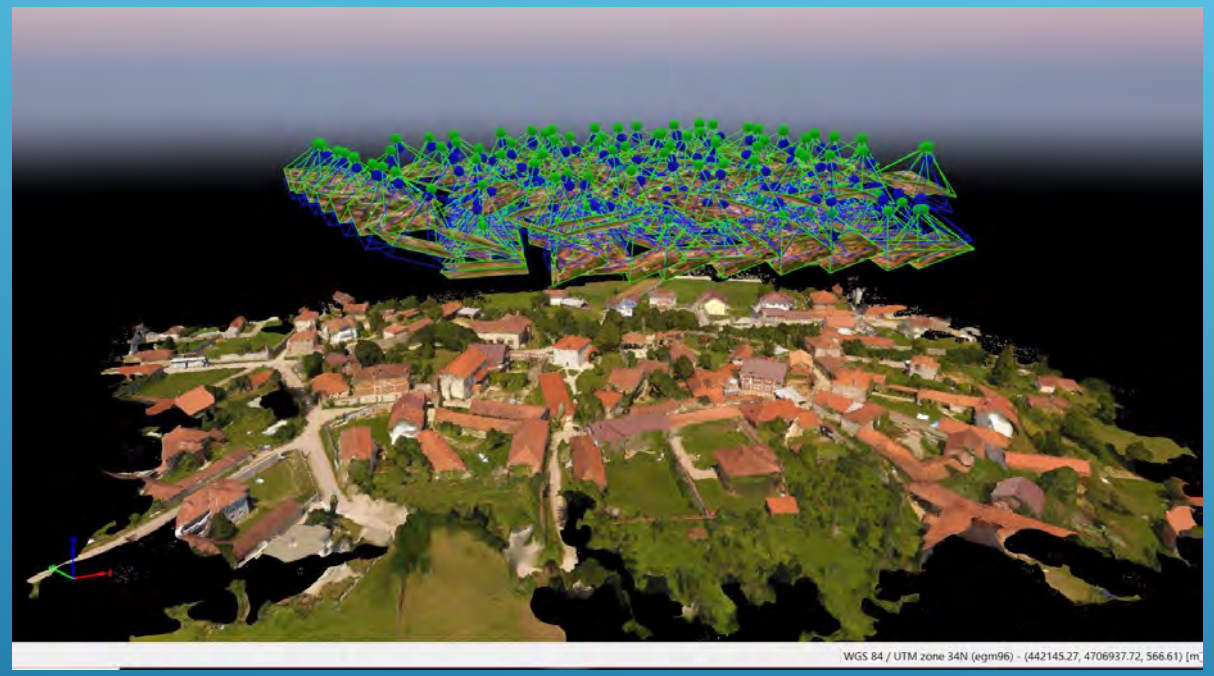
UNITED STATES OF AMERICA
EMBASSY KOSOVO

CAA

CH
WB
Cultural
Heritage without Borders


Remote Pilot





- Built with 2-3 floors with exterior stairs, mostly square in plan
- Built of stone and/or brick one meter thick at the bottom
- Interior floors constructed of tree trunks and upper ceilings with wooden planks

CASE EXAMPLE -DRANOC

Photo

Virtual Object

DRANOC


NOVOBËRDA
Highlighted Location

Accurate 3D perspectives can help clearly identify change regardless of the causes of change (i.e., caused by human and/or nature).

High resolution imagery is essential for detection, interpretation and measurement of small features often associated with cultural heritage preservation work.

Correctly scaled 2D imagery and properly render 3D virtual objects enable examination in detail and from numerous perspectives.

Cultural Heritage Site Documentation

- Find stake-holders (i.e., partners) that have complimentary interests
  - Academe
  - Governmental
  - Philanthropic
  - Industry
- Conduct a site survey before the study abroad (if at all possible)
- Plan for change and uncertainty

PREPARATION

- Continue and Expand Experiential Service Learning
  - provides students with real world experience
- Seek Additional Stake Holders
  - build upon success
  - advances all parties
- Apply lessons learned from day-to-day and year-to-year

FUTURE POSSIBILITIES

Metric	Quantity
Flight Hours	29.5
Sorties	140
Data Generated	405 GB
Photos Collected	8,247
4K Video	59 min 14 sec

OPERATIONAL SUMMARY


Daytona Beach

QUESTIONS ?

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