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Archaeological excavation campaign at Villa Adriana (Tivoli)

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Abstract

This report describes the first archaeological excavation campaign at Villa Adriana (Tivoli, Italy) conducted by Columbia University in June 2014. It represents a further step of the Advanced Program in Ancient History and Art (APAHA), which builds on the successful experience of two previous excavation seasons at Villa San Marco (Castellammare di Stabia, Italy). The fieldwork focused on two different areas of Hadrian's Villa, and was carried out by means of stratigraphic methodology and the use of experimental technology. Since this was the first campaign, results and historical interpretations are provisional. Nevertheless, it is possible to put forth some considerations about the adopted methodology.

1. Introduction / Background Information

The APAHA project –Advanced Program of Ancient History and Art– an international research program co-founded by the Italian Academy for Advanced Studies in the US (Columbia University) and the Honors Center of Italian Universities (H2CU)– based at the University of Rome "Sapienza"– pushed forward its archaeological interests by organizing an excavation campaign at Villa Adriana in June 2014. Professors Francesco de Angelis and Marco Maiuro (Columbia University), helped by the field director Daira Nocera (University of Pennsylvania), initiated the research activity at Hadrian's Villa within a broader framework, whose main aim is to clarify the dynamics of life in ancient Roman imperial residences. Instrumental and preliminary to this purpose were research trips to Roman Imperial villas in Rome and Lazio in 2013, the configuration of specific archaeological software and technological tools to be used on the field, and the development of a dedicated database – conceived jointly with the Archaeological Superintendence of Lazio, in collaboration with the Media Center for Art History (Columbia University). APAHA has developed a complex and varied didactic program, so far offered to thirty students coming from different universities and Countries, and not limited to digging activity, but complemented by daily seminars, workshops, lectures on more advanced and specific topics, and field trips to neighboring sites. The preliminary results of the 2014 archaeological season were presented at the Annual Conference of the Archaeological Institute of America (AIA), in January 2015.

2. Materials and Methods / Procedures

An excavation represents the crucial step of an archaeological research project: provided that an archaeological dig is by nature a destructive activity (since neither soil layer nor findings can be restored in their original status after being removed), it is necessary to know in advance exactly why, where and how to dig. APAHA's excavation campaign project, the excavation campaign at *Villa Adriana,* was indeed preceded by the following steps:

a) Pilot tour to imperial villas in Rome and Lazio

b) Geophysical survey

c) ArchMap database

d) Field database

a) In order to get a wider understanding of Hadrian's Villa and the Roman Imperial residential system as a whole, Prof. Francesco de Angelis and Prof. Marco Maiuro organized a pilot study tour to the imperial palaces and villas in Rome and Lazio in 2013. They guided a selected group of PhD Students (of Columbia University and University of Rome "La Sapienza"), through several imperial housing sites, some of which quite famous (the imperial complexes on the Palatine Hill in Rome, Hadrian's Villa at Tivoli, Tiberius Villa at Sperlonga, and Domitian's Villa at Castel Gandolfo), others less known and mainly inaccessible (Nero's Villa at Subiaco, Domitian's Villa at Sabaudia, and Trajan's Villa at Arcinazzo). By directly observing the ruins, analyzing and comparing their archaeological, epigraphic and literary evidence, along with general discussions, the group succeeded in gaining a better knowledge of these sites. Moreover, the participants gained a sense of what the fundamental topics would be to consider in the specific case study and future digging campaign at Hadrian's Villa. Among them are issues of accessibility to and within imperial residences and their relationship to the surrounding environment; functions of spaces and movement patterns (of both members of the court and servants); distribution and spatial relationships of specific activities within each villa; long-term use of these sites, their post-antique reuses and afterlife.

b) The ground-penetrating radar (GPR) survey— a geophysical non-destructive method that uses radar pulses to detect underground anomalies— was used in order to orient the excavation trenches.

c) The team designed and implemented a database within the frame of ArchMap Project (fig. 2). This database will be a digital tool specifically dedicated to *Villa Adriana*, developed in collaboration with the Media Center for Art History (Columbia University) and the Archaeological Superintendence of Lazio. It is meant to be both the project's archive and an interactive, open-source scientific resource for scholars and students interested in the villa. The database is still under construction and will contain a description of every part of the complex, including elevation, plan, chronology, an overview of sculptural and architectural decorations, interpretation, and bibliography. Plans, views, and drawings from the Renaissance onwards, and high-resolution images of statues and artifacts scattered among museums and collections throughout the world will also be part of the platform.

d) Field data recording by tablets: not a matter of fashion, of course, but the proper answer to some practical needs. Data recording and data entry on the spot, directly in the field, updating and synchronizing them among the users in real time, and benefitting from the immediate availability of plans, drawings, pictures and bibliography previously selected and uploaded has become a real plus in the most technologically updated programs of field archaeology.

3. Results

Thanks to these preliminary research phases, it was possible to accurately select two areas for field research: the so-called *Lararium* and the *Macchiozzo* (fig. 1). The *Lararium* is located in the southwestern part of the villa, within the wider *Vestibulum* area (the grand, main entrance to the complex). Characterized by a rectangular-shaped courtyard and enclosed within a wall with rectangular and semi-circular niches, it shares one side (east) with the *Vestibulum*'s main room, and it ends with a small temple raised from the surrounding level on the opposite side (west). W. L.Reichardt investigated this area in 1933, but some crucial features are still to be explained, such as the relationship to the main entrance room, the function of the temple and the chronological sequence of the different wall structures. The *Macchiozzo* area is located in the central part of Hadrian's Villa, in a spot never dug before, quite possibly not even during the most intensive antiquarian research between the 16th to 18th centuries. It is interesting to notice that the subterranean passageways –crossing the Villa, from the entrances, to the baths, to the dining rooms– seem to converge in this very place. Some scholars have advanced the educated guess that the *Macchiozzo* could have been a servile quarter, perhaps a large kitchen area. From the Renaissance on, the main interest in Hadrian's Villa focused on its prestigious rooms (covered in marble slabs and enriched with sculptural and architectural ornamentation). Therefore, much less is known about the servile quarters, even at present. The investigation in this area will likely deepen our knowledge about this dimension, as well as about the movement of individuals, vehicles and goods. However, only further excavation campaigns would give rise to more informed opinions about its use.

4. Discussion / Analysis

Villa Adriana, a UNESCO World Heritage Site, was an imperial residential complex, built under the reign of Emperor Hadrian between 118 and 138 AD, but only sporadically inhabited by him and his court. After his death in 138 AD, the ensuing Emperors are likely to have resided there only rarely. In fact, little evidence for the later phases has been uncovered yet, besides a few portraits belonging to members of imperial dynasties, later than Hadrian, *per se* not a safe clue that the court and Emperors resided there.

However, no archaeological campaign has so far focused on post-Hadrianic phases of the Villa. In this respect, the *Lararium* seems a promising spot where to gather data for this matter, since it presents several structures built in different materials and techniques that could suggest later phases of occupation. Students were taught the stratigraphic excavation technique, a procedure that peels the different soil layers, from the most recent to the most ancient ones, in order to obtain a chronological and historical report (fig. 3). Every layer, just like every object found therein (pottery and glass fragments, bones, collapsed plaster and marble revetments, coins, special finds, etc.) was accurately described and recorded in Stratigraphic Units (SU), on the tablets. The plans for each layers were drawn chiefly by means of the Total Station (fig. 4): a precision laser tool measuring angles in the horizontal and vertical plans, as well as horizontal and inclined distances. Building remains, for their relevance in establishing relative and absolute chronology, were also recorded by means of hand drawings, a technique as traditional as still more accurate than any technological devices (fig. 3).

In the *Macchiozzo* area students were taught to use the same procedure, but in this case, they were more involved in

sifting the terrain, since soil layers were here less contaminated than in the *Lararium*.
A ceramic expert taught the students how to analyze pottery fragments, namely washing and cleaning them, distinguishing and sorting them out according to their types and classes (i.e. kitchen ware, amphorae, etc.), and recording each fragment with the appropriate SU's number (fig. 5).

At the end of every digging day, students and team were involved in on-site presentations of *Villa Adriana*'s buildings, as well as seminars and workshops about specific topics, such as archaeological photography, pottery classification, and the history and art of the Roman Empire during Hadrian's time. Weekends were devoted to didactic trips to neighboring sites and museums.

5. Future work

Future excavation campaigns will build on the results of the first season, and accordingly will be carried out with more specific research questions and aims.
Since the *Lararium* trench covered just half of the whole extension of the site, and provided a great deal of new data, excavations will most likely be extended to the whole area, perhaps even beyond it. On the contrary, the *Macchiozzo* trench would possibly be narrowed, since it has been possible to identify several interesting structures that remain to be properly excavated.
The use of specially developed software and technological tools will be implemented, thanks to the experience APAHA acquired during the first season.
Technical analysis on the sculptural and architectural ornaments will be undertaken, together with studies of the coins, metal and bones found, since the first campaign concentrated mainly on analysis of the ceramics and architecture.
Students could be divided into two different groups, depending on their level of expertise. Thanks to the successful results and feedback of the first season, next year's "neophytes" would be involved in on-site presentations, seminars and workshops, as much as those in the first campaign, whereas more experienced "veterans" will be given the possibility to participate in more challenging and demanding tasks, and would be required to attain a higher level of archaeological and historical analysis.

6. Acknowledgments

I would like to thank H2CU for giving me the opportunity to take part in the APAHA program. I would like also to express sincere thanks to Professor Francesco de Angelis, Professor Marco Maiuro and field director Daira Nocera for their teachings, encouragement, and constant support. Thanks to my incomparable colleagues, Joe Sheppard and Emily Cook, for being generous, helpful and close-knit partners in this endeavor. Thanks to Simone Zof for his precious technical advice.

Figures

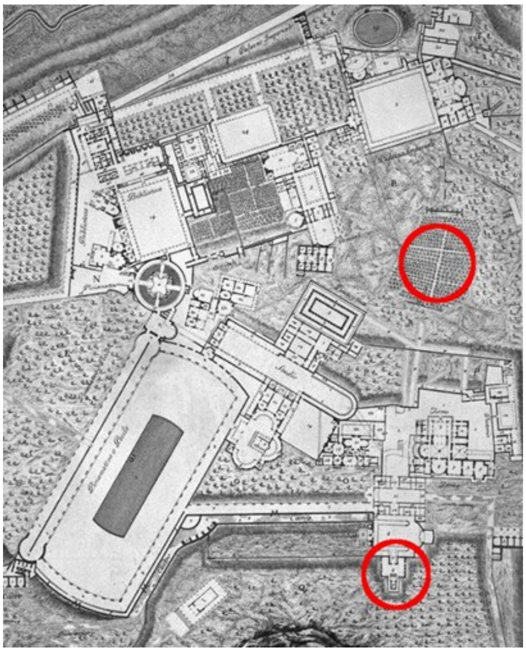

Fig. 1: G. B. Piranesi, Villa Adriana, plan, detail of the northern side. The red circles signal the *Macchiozzo* area (above) and the *Lararium* (below)

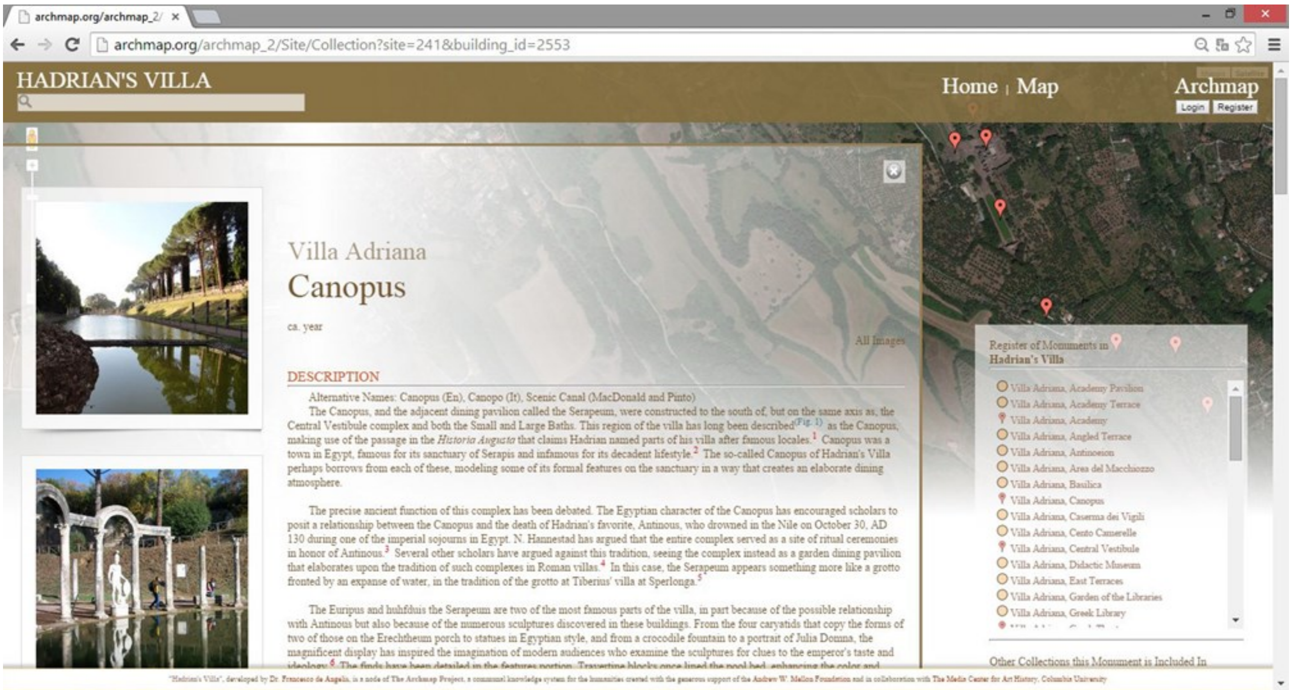

Fig. 2: ArchMap Project (Columbia University, Media Center for Art History): Hadrian's Villa webpage, detail of the "Canopus" page (www.archmap.org)

Fig. 3: Students digging. They are involved in stratigraphical excavation (left, above and below), in measurements recording (above), and in hand drawing (right, below). Photo J. Johnson

Fig. 4: Student recording measurements by means of the Total Station. Photo A. Tartaro

Fig. 5: Students cleaning and analyzing pottery fragments. Photo: J. Johnson

Brooklyn Atlantis: Environmental monitoring through robots and citizen science

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Abstract

Environmental monitoring often consists of collecting and analyzing large amounts of data. While certain types of data are amenable for centralized analysis, citizen science may be used to tackle the issue of requiring human analysis of large amounts of data, such as image classification. In this paper, we discuss the development and recent results of the citizen science project "Brooklyn Atlantis," which consists of mobile robots collecting data in a polluted body of water for the purpose of environmental monitoring. The mobile robots collect and upload the data to a server, where citizen scientists contribute to the project through a web-based interface. While the majority of users contribute online, extensions of the project have enabled on-site participation and use in physical therapy scenarios.

1. Introduction

Environmental monitoring aids in protecting both the public and the environment itself from contaminants, while allowing scientists to monitor the state of wildlife presence. Advances in sensing have allowed for monitoring domains with little or no manpower through the use of sensor networks [1]. By placing sensors throughout an environment, scientists can collect data useful for assessing pollution, climate trends, or wildlife migratory patterns, for example. In the "Macroscope in the Redwoods" project, for instance, scientists strategically placed sensors to measure air temperature, humidity, and solar radiation in a redwood forest to capture the complex spatio-temporal dynamics of the microclimate within the environment [2]. Such a system allows for capturing large amounts of data with high resolution in both time and space. While the quantification of large amounts of data such as these can typically be accomplished in an unsupervised manner with a computer, qualification of data may require significant manpower, for example, if a large number of images need to be classified. Citizen science is one methodology for distributing this task to a large number of volunteers. To analyze a large number of galaxies, the scientists of the "Galaxy Zoo" project have created a web-based interface through which volunteers can classify images after a short training period [3].

In this article, we summarize recent progress on the National Science Foundation-funded project "Brooklyn Atlantis." Brooklyn Atlantis is a citizen-science environmental monitoring project, focused on the Gowanus Canal in Brooklyn, New York -- a heavily polluted waterway that was designated to require special attention from the Environmental Protection Agency for remediation. In its industrial past, oil, coal, and gas companies lined its sides [4], and environmental neglect contributed to its current state. Presently, the surrounding neighborhood has transitioned from industrial to residential and commercial, yet the city's combined sewage outflows and street runoff continue to hamper its recovery [5]. As part of its superfund status, the EPA is taking action to improve the canal, including reducing the amount of raw sewage released into the canal, installing a flushing tunnel to pump in cleaner water, and treating the sediment, which may be the most toxic aspect of the waterway. In addition to the water supplied by the flushing tunnel, underground streams ay supply the canal with fresh water in select regions [6]. Launched in October of 2012, Brooklyn Atlantis involves the general public in the monitoring of the recovery of the Gowanus Canal [7].

2. Materials and methods

Brooklyn Atlantis consists of two main components, that is, hardware and software. The hardware component, comprised of mobile aquatic robots, collects large amounts of data in terms of water quality and raw images from above and below the water surface. While the water quality data can be easily assessed by a single researcher, classification of the images is facilitated through the software component, distributing the task to hundreds of citizen scientists through a web-based interface.

The development of the first prototype has been detailed in [7]. The robot was constructed from corrosion-resistant PVC parts and featured a dual-thruster arrangement for maneuverability, an anchor for low-power station keeping, various water quality sensors, and an on-board computer. This robot proved functional and robust as demonstrated by its two-years of weekly deployments in the canal, yet certain areas, such as overall weight, portability, and performance, warranted the design and realization of a second prototype. The novel robot builds on the previous design and improves in the deficient areas identified. The dual-hull design was maintained, providing ample stability and buoyancy, see Figure 1. Shifting from PVC-construction to an aluminum monocoque design with various access panels has both reduced the overall weight of the structure and eliminated the need for any additional watertight containers, as all electronics are now mounted directly within the body of the vehicle. The entire body is made from aluminum sheet metal, which was precision laser-cut, bent, and welded into its final form. Angled faces at the front of the robot significantly reduce the drag, thereby providing faster speeds and longer distances travelled on a single battery charge. The battery chemistry has been switched from the lead-acid type used on the previous robot to lithium-polymer, offering double the power density, with the main drawbacks of increased cost and complexity of recharging.

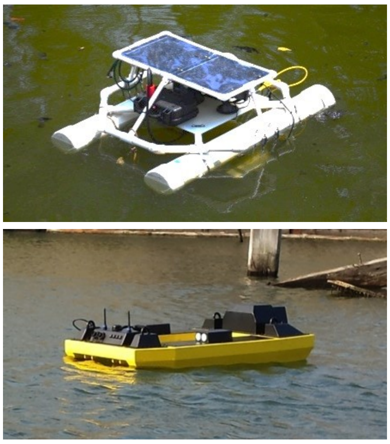

Figure 1: Original prototype (top) and new robot (bottom) collecting data in the Gowanus Canal.

While the structure is completely novel, most of the electronics, including the thrusters, have been carried over from the previous design, as they have been proven on the previous prototype to perform adequately. The data collection and transmitting tasks are handled by an embedded computer paired with a microcontroller, the combination of which queries the cameras, water quality sensor, and GPS module and periodically logs and transmits the data to the base station at NYU Polytechnic School of Engineering.

The base station feeds the website, www.brooklynatlantis.org, with a stream of images captured by the robot. By visiting the website, citizen scientists can view the images, and tag objects that are deemed noteworthy in the scene, such as animals, debris, or pollution. Through these contributions, the researchers of Brooklyn Atlantis are provided with usable data regarding the environment. Citizen scientists also have the opportunity to form friendship networks and discuss topics of interest on the forum. To enable hypothesis-driven research on the network of citizen scientists, researchers are able to systematically vary certain aspects of the website, such as the ability to form friends, provide indicators of performance, and assign collaborative or competitive tasks. Investigating the effect of each of these factors on individuals' performance may allow for custom tailoring the interface on a per-user basis to maximize the contribution of the network of citizen scientists.

Important to attracting and maintaining participation in citizen science projects is to ensure that the citizen scientists feel that they are contributing to something meaningful [8]. In this context and within Brooklyn Atlantis, providing the citizen scientists with up-to-date and interesting images for tagging is crucial. Weekly deployments provide users with thousands of images to tag, yet an added degree of interactiveness could be achieved by incorporating high-resolution panoramic photos that can be panned and zoomed, thereby allowing users to 'investigate' each photo and discover.

In the context of classifying data in panoramic photos, neighborhood audits for assessing safety and aesthetics has historically been done in person, however Google Street View recently been used to perform this task remotely with positive results [9]. Street View consists of a series of 360-degree panoramic photos, which provide viewers with a complete representation of the scene in all directions.

Closer to citizen science, Street View has also recently been used to crowdsource the task of assessing wheelchair accessibility of sidewalks [10] and identifying wildlife habitats [11]. Although groups such as Google utilize an array of cameras to capture one of the 360-degree panorama photos observed in Street View, a similar effect can be achieved with a single camera that takes snapshots at various poses. In particular, if a wide-angle lens is used, a sequence of six snapshots is required to stitch together a 360-degree panorama.

Drawing inspiration from this, an automated camera rig was developed that pans a high-resolution camera to take four snapshots at 90 degree intervals, tilts the camera to capture one snapshot directly up, and tilts the camera again for the final snapshot directly down, see Figure 2. The mechanism utilizes two DC motors for actuating in the pan and the tilt directions, and 10-bit encoders are used for angular position feedback.

Figure 2: Mobile robot deployed in the canal with pan-tilt camera rig mounted above.

A microcontroller interfaces with the two encoders and motors, and implements a proportional-integral controller [12] on the position of each joint. A set of angles is programmed in, such that at each necessary angle the microcontroller triggers the camera, a Nikon D7000. After each deployment, the photos captured by the D7000 are loaded on to a desktop computer for post-processing, where the six images are stitched together to form a single panoramic photo measuring 8000 pixels wide by 3910 pixels high, see Figure 3. While these panoramic photos captured by our robot are currently hosted on websites such as Google Views and 360cities, the Brooklyn Atlantis web-based interface is currently being modified to accommodate such images with the ability to tag.

Figure 3: Example of 360 panorama captured by the robot.

To accurately quantify the water quality throughout the canal, position data of the robot is collected using a Venus GPS module at a rate of 5 Hz, while a YSI multi-parameter sonde collects dissolved oxygen, pH, conductivity, and temperature data. These two sensors are polled by a microcontroller, which logs the data to a micro-sd card.

The combination of position data provided by GPS and water quality data provided by the multi-parameter sonde allows for mapping spatial trends in the canal.

3. Results and discussion

The water quality data collected throughout the canal evinces interesting trends. While earlier results illustrated increasing dissolved oxygen as the robot moves south in the canal [7], towards the ocean, more recent results indicate an increase in dissolved oxygen moving north in the canal, see Figure 4. This is likely do to the operation of the flushing tunnel, which was activated in May of 2014, bringing in water from the East River. Also noticeable in Figure 4 are peaks in the pH and salinity at the north end of the canal. These peaks mark the precise location of where the flushing tunnel pumps in the salty East River water. The trends in water quality, which show areas more hospitable for wildlife, may be used for the citizen scientists to correlate animal presence with water quality, as it is expected to find more wildlife presence in the areas with better water.

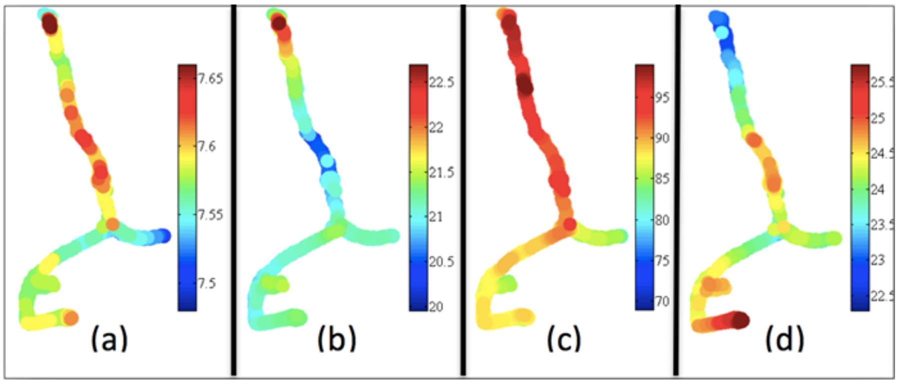

Figure 4: Water quality data collected by the mobile robot. (a) pH, (b) salinity [ppt], (c) dissolved oxygen [%], (d) temperature [C]

Although the web-based interface is the primary means for citizen scientists to contribute to Brooklyn Atlantis, local community members have been extensively involved in on-site participation through various outreach events at the canal. Gowanus Voyage [13] was a collaborative effort between the engineers of Brooklyn Atlantis and a group of artists who developed an interactive artwork on a similarly polluted body of water, the Newtown Creek, and consisted of sensor equipped miniature remote controlled boats that were styled to be representative of issues with the canal. Community members piloted the boats with iPods, and in doing so, collected water quality data. In a similar manner to the robot, each boat was equipped with a GPS sensor, water quality sensor, and a microcontroller. The microcontroller transmitted the GPS and water quality data to a base station, where the local citizen scientists could view in real time plots of the data that they were collecting. At the same time, the base station received commands from the iPod controllers, and relayed them to the boats using a wireless link. This event has been held annually since 2013 during the Summer, and typically attracts about 200 visitors over its five-hour duration.

Beyond Gowanus Voyage, a series of similar events was held in the Fall of 2014. The set sensor-equipped boats were modified to take input from a Microsoft Kinect sensor, thereby allowing participants to control the boats with simple arm gestures. The use of the Kinect sensor served to provide an engaging way for citizen scientists to collect data, and also perform an exploratory study on the feasibility of using citizen science rehabilitation exercises. Similar exploratory studies have been conducted using Brooklyn Atlantis. In particular, a low-cost haptic device was paired with a laptop computer to deliver young rehabilitation patients in a children's hospital a means to contribute to Brooklyn Atlantis while performing therapeutic exercises [14]. Using this system, patients navigated a virtual environment of the canal using the haptic device, and experienced a force feedback dependent upon their path-following performance. At various waypoint along the canal, images captured by the Brooklyn Atlantis robot appeared, which were to be analyzed and tagged. In a set of controlled trials, wherein a path following task with no citizen science component was also performed, participants in general preferred the task that allowed them to contribute to the environmental monitoring project. The importance of this finding lies in the fact that the task with citizen science took on average four times as long to complete when compared to the one without. Where patient compliance in performing rehabilitation exercises is an important factor in maximizing effectiveness, the inclusion of citizen science tasks in exercises may be a means to increase overall engagement of the exercises and the willingness of patients to repeat and spend time on them.

4. Conclusion and Future Work

This paper presented the development and recent results of the environmental monitoring project Brooklyn Atlantis. Citizen science is used to analyze the large amounts of image data collected by aquatic mobile robots operating in the Gowanus Canal. The citizen scientists contribute through a web-based interface, which also allows researchers to investigate strategies for optimizing their performance. Extensions of the project have enabled on-site citizen science participation, as well as the use of the project tin a physical therapy setting.

Future efforts will work focus on long-term deployments and monitoring of the canal towards providing citizen scientists with a continuous stream of data for classification. To this aim, solar recharging of the robotic vehicle's batteries will be implemented, and autonomous motion algorithms will minimize the need for human supervision at the canal. Building on the preliminary work involving rehabilitation exercises, we seek to actively involve patients undergoing rehabilitation treatments in citizen science to provide more engaging exercises, and to better understand how collaborating and competing with others in citizen science may further enhance participation.

5. Acknowledgments

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6. References

1. Yick J, Mukherjee B, Ghosal D (2008) Wireless sensor network survey. Computer Networks 52: 2292-2330.
2. Tolle G, Polastre J, Szewczyk R, Culler D, Turner N, et al. (2005) A macroscope in the redwoods. Proceedings of the 3rd international conference on Embedded networked sensor systems: ACM. pp. 51-63.
3. Raddick M, Bracey G, Gay P, Lintott C, Murray P, et al. (2010) Galaxy Zoo: Exploring the motivations of citizen science volunteers. Astronomy Education Review 9: 010103.
4. Gerhard N (1906) Plan for the improvement of the Gowanus Canal, Brooklyn, New York: Massachusetts Institute of Technology.
5. EPA (2014) Gowanus Canal. http://www.epa.gov/region2/superfund/npl/gowanus/: Environmental Protection Agency.
6. Williams K (2014) Forensic hydrology at the Gowanus Canal. New York Times. http://www.nytimes.com/2014/08/31/nyregion/forensic-hydrology-at-the-gowanus-canal.html?_r=0. pp. MB1.
7. Laut J, Henry E, Nov O, Porfiri M (2013) Development of a mechatronics-based citizen science platform for aquatic environmental monitoring. IEEE Transactions on Mechatronics 19: 1541-1551.
8. Nov O, Arazy O, Anderson D (2014) Scientists@ Home: what drives the quantity and quality of online citizen science participation? PloS ONE 9: e90275.
9. Rundle A, Bader M, Richards C, Neckerman K, Teitler J (2011) Using Google Street View to audit neighborhood environments. American journal of preventive medicine 40: 94-100.
10. Hara K, Sun J, Chazan J, Jacobs D, Froehlich J (2013) An Initial Study of Automatic Curb Ramp Detection with Crowdsourced Verification Using Google Street View Images. AAAI Conference on Human Computation and Crowdsourcing.
11. Olea P, Mateo-Tomás P (2013) Assessing species habitat using Google Street View: A case study of cliff-nesting vultures. PloS ONE.
12. Dorf R, Bishop R (2011) Modern control systems: Pearson.
13. Laut J, Nelson Wright S, Nov O, Porfiri M (2014) Gowanus voyage: Where Mechatronics, Public Art, Community Members, and Environmental Science Meet. IEEE Control Systems Magazine 34: 60-64.
14. Laut J, Cappa F, Nov O, Porfiri M (2014) Increasing patient engagement in rehabilitation through citizen science. ASME Dynamic Systems and Control Conference.

PopUps Interview with Tiziana Bartolini

Name: Tiziana Bartolini

Where are you from? Rome, Italy

Where do you work now? NYC Department of Environmental Protection

What is your position? Environmental Scientist

Your story: At the end of my Italian degree in Natural Sciences, I started an experience as research assistant at the NYU Polytechnic School of Engineering in NY. Professor Porfiri and H2CU gave me the opportunity to do it, offering me all support for the entire duration of this experience. At the end of this 6 months term, I applied to NYU Polytechnic School of Engineering to do a M.S. in Environmental Science with focus on Water Resources; in the while I have continued to work in Professor Porfiri laboratory. I graduated in May 2014 and right now I am an intern in NYC Department of Environmental Protection in the Bluebelt Department, a natural solution to stormwater management. The program (Staten Island Bluebelt Program) preserves natural drainage corridors, including streams, ponds, and other wetland areas. So, the project provides community open spaces and diverse wildlife habitats.

Your accomplishments: During my research period at NYU I had the chance to be involved in writing scientific papers:

Bartolini, T., Butail, S., Porfiri, M.: "Temperature influences sociality and activity of freshwater fish", Environmental Biology of Fishes, accepted for publication

Laut, J., Bartolini, T., Porfiri, M.: "Bioinspiring an interest in STEM", IEEE Transactions on Education, in press

Butail, S., Bartolini, T., Porfiri, M., 2013: "Collective response of zebrafish shoals to a free-swimming robotic fish", PLoS ONE 8(10), e76123

Cianca, V., Bartolini, T., Porfiri, M., Macri, S., 2013: "A robotics-based behavioral paradigm to measure anxiety-related responses in zebrafish", PLoS ONE 8(7), e69661

Abaid, N., Bartolini, T., Macri, S., Porfiri, M., 2012: "Zebrafish responds differentially to a robotic fish of varying aspect ratio, tail beat frequency, noise, and color", Behavioural Brain Research 224(2), 545–553

The Staten Island Bluebelt Program:

http://www.nyc.gov/html/dep/pdf/brochures/si_bluebelt_brochure.pdf

PopUps Interview with Emanuele Maccherani

Name: Emanuele Maccherani

Where are you from? Perugia, Italy

Where do you work now? VMTurbo, New York City office

What is your position? Senior Software Engineer

Your story: I have done my Ph.D in Computer Science at University of Perugia with Prof. Reali, with a research on VoIP, infrastructure/service virtualization and software-defined networks. During my last year I came in New York for a joint project at Columbia University, working with Prof. Schulzrinne, called NetServ. The idea was to have an active networking mode where programmable routers inside the core of Internet were able to execute services and applications. I have extended the prototype providing it with a fast hardware Open Flow-enabled data-path and implementing the OpenFlow controller in software, as a NetServ service itself. I decided to look for a job position in the US and now I am working at the VMTurbo Startup.

Your accomplishments: The research project here in New York produced publication presented at:

IEEE/IFIP NOMS 2012, Maui, Hawaii

And we have presented demos and tutorial at:

GEC11 Conference, Denver, CO, USA

GEC12 Conference, Kansa City, MO, USA

PopUps Interview with Ionid Xhakollari

Name: Ionid Xhakollari

Where are you from? Tirana, Albania

Where do you work now? Mini-Circuits

What is your position? Manufacturing Process Engineer

Your story: I was born in Tirana, Albania in 1988. My family emigrated to Italy in 1995 and established in Rome, When I was a child I used to dissassemble all my toys to figure out way they worked. Tha curiosity has always been with me and brought me to becoming a Mechanical Engineer. (When I knew about the opportunity to finish) When I learned about the opportunity of finishing my studies in the US and earn an American Degree, I decided to try that adventure.... And I succeeded. My life totally changed in a day. Of course I miss my family, my friend and the city that gave me everything I have, but I think it was worth to discover a culture that if carefully investigated comes out being far from what I know and consider common. Furthermore, I had the opportunity to start my career and build uop my working experience in the US, I am sure this will help me in my future jobs.

Your accomplishments: I got a Dual Degree in Mechanical and Industrial Engineering from Sapienza University of Rome and NYU Polytechnic School of Engineering in two years. Started my first job in NYC in July 2013 ad a Mechanical Engineer designing Electrostatic Precipitators. Moved to my current job in May 2014, this job better fits my technical background since it exposes to me to the manufacturing environment.

PopUps Interview with Angelo Tafuni

Name: Angelo Tafuni

Where are you from? Altamura, Italy

Where do you work now? NYU Polytechnich School of Engineering

What is your position? Ph.D.

Your story: After a year as an exchange student in 2009 at the Technical University of Eindhoven in the Netherlands, I decided to enroll in a Double Degree program between Politecnico di Bari and NYU Polytechnic School of Engineering. I arrived in New York City in the fall of 2010 and ended this program in January 2012, after which I continued my studies towards a doctoral degree in the Department of Mechanical and Aerospace Engineering at NYU. Funds for my Ph. D. were granted by the Department Head, who offered me a 4-year teaching fellowship that I gladly accepted. Not only does this fellowship cover education costs and stipend, it also enables me to teach different classes at the undergraduate level. This is something that I value highly inasmuch as it helps me understand whether teaching could be a future career path or not. The overall experience has been (and still is) a once-in-a-lifetime life-changing opportunity. It has heightened my consciousness of science and engineering, it has allowed me to admire differences in academia and get the best out of what an exchange program could offer, it has given me the chance of meeting people of different backgrounds, ethnicities, ideas, and beliefs, and share my thoughts, my work or even just a beer with them. Finally, it has made me a better man.

There is plenty to be grateful for. My family that has made all this possible, the people and coordinators on both institutions that work hard every day to promote these programs, H2CU which provides the students and researchers with a great deal of support.

Your accomplishments: Among the accomplishments so far are the master degree from both institutions, a few scientific publications and the completion of two full years of Ph. D. and 15 of the 21 credits scheduled for classwork.

H2CU Center at a Glance

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