University of the District of Columbia
Architectural Research Institute

Annual Report
FY 2015

Serving The Community

Making A Difference
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EXECUTIVE SUMMARY

The Architectural Research Institute (ARI) was founded in 1987 through an intercity collaboration between the District of Columbia Department of Housing and Community Development (DHCD) Homestead Preservation Program and the University of the District of Columbia. The collaboration between ARI and DHCD was, and still is, to provide comprehensive architectural services to allow for the reclamation of the city’s vacant, boarded and run down housing, in order to rehabilitate the properties so that they might be offered to low- and middle-income residents of the District of Columbia, thus giving these residents the opportunity of becoming homeowners.

Mr. Clarence W. Pearson, FAIA has been the director since the inception of ARI and is still providing leadership and vision for the future.

Although ARI’s primary client for the past twenty plus years has been the former Homestead Program, which has transitioned to PADD (Property Acquisition Disposition Division), the Institute’s staff and students also provide design and architectural services to other governmental agencies including the Department of Public and Assisted Housing and the District of Columbia Public Schools on a volunteer basis. Technical services are also provided to nonprofit organizations which have included Manna, the People’s Involvement Corporation and East of the River Corporation during off-duty hours (a complete list is enclosed).

Since its inception, ARI has provided architectural services on the renovation and rehabilitation of more than 640 homes and apartments at a cost of more than $94,500,000. As a result, these properties are once again part of the tax base for the city. Thousands of lives have been positively impacted by the services of ARI through its contract with DCHD (PADD Program and Single Family Program).

ARI, in partnership with the UDC Architecture Program faculty, provides a means for students to become involved in critical design and construction issues confronting the city. In keeping with that tradition of land grant college’s services to its community, all of the teaching and research is within the framework of providing directions and solutions to problems, including low and moderate income housing, shelter for the homeless, homesteading opportunities, community and institutional facilities and many of the other physical components of neighborhood economic revitalization strategies. This provides students in the Architecture Program with the unique opportunity to incorporate exposure to actual community projects during their education and to have hands on experience in a wide cross section of activities associated with the practice of architecture such as: field documentation, specification writing, interaction with other professionals, and client contact through project administration.
**MEMORANDUM OF UNDERSTANDING (MOU) GRANTS with The Architectural Research Institute**

<table>
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<th>YEAR</th>
<th>INDIRECT FEES</th>
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<td>2014</td>
<td>$176,962.00</td>
<td>$884,632.00</td>
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<tr>
<td>2015</td>
<td>$165,483.00</td>
<td>$823,642.00</td>
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<td><strong>$2,736,653.00</strong></td>
<td><strong>$13,673,827.00</strong></td>
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The University of the District of Columbia, as the nation’s only Urban Land Grant University, has the opportunity to promote this land grant designation within the city through its joint ventures with other local government agencies. ARI has contributed its architectural services to projects in all wards of the city. These projects include all areas of the built environment within the District of Columbia and it enables the city to become a “working model” in which students of the university are able to confront (and find solutions too) the many issues that impact our urban environment.
ARI, which is the clinical arm of the architecture program at the University of the District of Columbia, provides services that include:

- analyzing existing buildings to determine the feasibility of rehabilitation
- documenting the condition of existing structures
- preparing schematic designs
- preparing construction documents
- obtaining construction building permits
- reviewing construction proposals
- weekly monitoring of construction process until final completion.

Training sessions are provided to the residents of the District of Columbia who are participants in the PADD Program.

The following are a few examples of completed and current projects under construction:
## Ward 1 Address
- 756 Park Road, NW
- 2801 Sherman Avenue, NW

## Ward 2 Address
- 1031 4th Street, NW
- 1504 6th Street, NW
- 445 S Street, NW

## Ward 3 Address
- 454 N Street, NW
- 813 4th Street, NE

## Ward 4 Address
- 1825 Central Place, NE
- 1827 Central Place, NE
- 1829 Central Place, NE
- 1837 Central Place, NE
- 1839 Central Place, NE
- 1841 Central Place, NE
- 1843 Central Place, NE
- 1845 Central Place, NE
- 1860 Central Place, NE

## Ward 5 Address
- 1862 Central Place, NE
- 1864 Central Place, NE
- 850 19th Street, NE
- 1214 Staples Street, NE
- 1259 Hollbrook Terrace, NE
- 1214 Montello Avenue, NE
- 1612 Montello Avenue, NE
- 1663 Montello Avenue, NE

## Ward 6 Address
- 454 N Street, NW
- 813 4th Street, NE

## Ward 7 Address
- 4924 Nash Street, NE
- 4336 Douglas Street, NE
- 323 62nd Street, NE
- 4404 Foote Street, NE
- 202 36th Street, SE

## Ward 8 Address
- 2321 High Street, SE
- 1700 W Street, SE
- 1704 W Street, SE
- 1708 W Street, SE
- 1712 W Street, SE
- 1716 W Street, SE
- 1720 W Street, SE
- 2525 Minnesota Ave, SE
- 2300 Hunter Place, SE
- 1648 U Street, SE
- 53 Forrester Street, SW
- 35 Forrester Street, SW
- 61 Forrester Street, SW
- 2206 16th Street, SE
- 1326 Valley Place, SE
- 1715 28th Place, SE
- 1717 28th Place, SE
1825, 1827, 1829 Central Place, N.E.
TWO STORY, THREE UNITS IVY CITY PASSIVE TOWNHOUSES

BEFORE

DURING CONSTRUCTION

INTERIOR VIEWS
1837, 1839, 1841, 1843, 1845 Central Place, N.E.
TWO STORY, FIVE UNITS IVY CITY TOWNHOUSES

BEFORE

DURING CONSTRUCTION

INTERIOR VIEWS
1860, 1862, 1864 Central Place, N.E.
TWO STORY, THREE UNITS IVY CITY TOWNHOUSES

DURING CONSTRUCTION
323 62nd Street, N.E.
FOUR STORY 39-UNIT APARTMENT BUILDING
ONE AND TWO BEDROOM UNITS

EXTERIOR VIEWS
323 62nd Street, N.E.
FOUR STORY APARTMENT BUILDING: ONE AND TWO BEDROOM UNITS

INTERIOR VIEWS
4924 Nash Street, N.E.
THREE STORY APARTMENT BUILDING WITH BASEMENT

BEFORE

AFTER

EXTERIOR VIEWS

INTERIOR VIEWS
813 4\textsuperscript{th} Street, N.E.
THREE STORY ROW HOUSES WITH BASEMENT, TWO UNITS

BEFORE

AFTER

INTERIOR VIEWS
1214 Staples Street, N.E.
TWO STORY APARTMENT BUILDING

DURING CONSTRUCTION

INTERIOR VIEWS
1214 Montello Avenue, N.E.
TWO STORY ROW HOUSE WITH BASEMENT

BEFORE

AFTER CONSTRUCTION

INTERIOR VIEWS
1612 Montello Avenue, N.E.
TWO STORY ROW HOUSE WITH BASEMENT

BEFORE

INTERIOR VIEWS

DURING CONSTRUCTION
1663 Montello Avenue, N.E.
TWO STORY ROW HOUSE WITH BASEMENT

BEFORE

DURING CONSTRUCTION
DURING CONSTRUCTION

EXTERIOR/INTERIOR VIEWS
W Street, S.E. Properties Continued
DURING CONSTRUCTION, INTERIOR VIEWS

INTERIOR VIEWS
Rehabilitation Program
ARI provided scopes of work, construction costs estimates and construction documents for the Single Family Residential Rehabilitation Program (SFRRP). The program provides loans and grants with a possible maximum usage of up to $75,000 upgrade home repairs to minimum building property standards. The funds assist households with financing home repairs that will address DC building code violations, and threats to health and safety. The program also assist with roof repairs or replacement, and installation or retrofitting of accessible plumbing fixtures and handicap accessibility.

Roof Repair Program
This Program is part of the SFRRP and provides grant of up to $15,000 to replace the roof. This grant pays for exterior roofing and gutter work only.

Handicap Accessibility Improvement Program (HAIP)
This Program is part of the SFRRP and provides a grant of up to $30,000 for improvements needed to remove physical barriers within a home for persons with mobility or other physical impairments.

The following are a few examples of completed projects.
### SINGLE-FAMILY RESIDENTIAL REHABILITATION PROGRAM


<table>
<thead>
<tr>
<th>Ward 1 Address</th>
<th>Ward 5 Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>1632 Oak Street, NW</td>
<td>52 Florida Avenue, NE</td>
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<tr>
<td><strong>Ward 4 Address</strong></td>
<td><strong>1244 Franklin Street, NE</strong></td>
</tr>
<tr>
<td>6703 6th Street, NW</td>
<td>27 Quincy Place, NE</td>
</tr>
<tr>
<td>4329 3rd Street, NW</td>
<td><strong>Ward 7 Address</strong></td>
</tr>
<tr>
<td>450 Newton Place, NW</td>
<td>1015 50th Place, NE</td>
</tr>
<tr>
<td>512 Whittier Street, NW</td>
<td>4547 Eads Street, NE</td>
</tr>
<tr>
<td>1331 Hemlock Street, NW</td>
<td>265330th Street, SE</td>
</tr>
<tr>
<td>4431 New Hampshire Avenue, NW</td>
<td>926 48th Street, NE</td>
</tr>
<tr>
<td><strong>6th Street, NW</strong></td>
<td><strong>4061 Grant Street, NE</strong></td>
</tr>
</tbody>
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**Southwest Washington, D.C.**

<table>
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<th>Location</th>
<th>Number</th>
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<tr>
<td>Newton Place, NW</td>
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<tr>
<td>Whittier Street, NW</td>
<td>512</td>
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<tr>
<td>Hemlock Street, NW</td>
<td>1331</td>
</tr>
<tr>
<td>New Hampshire Avenue, NW</td>
<td>4431</td>
</tr>
</tbody>
</table>
6703 6th Street, NW

6703 6th Street, NW is a single family detached dwelling, with 2-stories of brick & siding, and a basement. A.R.I. was requested to prepare a scope of work, construction estimate, construction drawings and obtain the building permit to convert existing closet into a handicap shower.

52 Florida Avenue, NE

52 Florida Avenue, NE is a single family row-dwelling, with 2-stories of brick, and a basement. A.R.I. was requested to prepare the scope of work and construction estimate for roof repair and light interior rehabilitation.

1244 Franklin Street, N.E.

1244 Franklin Street, NE is a single family detached dwelling, with 2-stories of siding, and a basement. A.R.I. was requested to prepare the scope of work, and construction estimate for an electrical upgrade, plumbing repairs, interior rehabilitation, and roof replacement.
1015 50th Place, NE is a one-story, single family detached dwelling, with 1-stories of siding. A.R.I. was requested to prepare the scope of work and construction estimate for exterior and interior rehabilitation. Special attention was requested for the exterior shell.

4547 Eads Street, NE is a single family semi-detached dwelling, with 2-stories of brick, and a basement. A.R.I. was requested to prepare the scope of work and construction estimate for light interior rehabilitation and exterior improvements.

2653 30th Street, SE is a single family row-detached dwelling, with 2-stories of brick, and a basement. A.R.I. was requested to prepare the scope of work, construction cost estimate, construction drawings, and obtain the building for interior handicap work and exterior porch replacement.
ARI has provided technical services to many community organizations that needed a helping hand in getting started on their dreams for making a positive impact on their surrounding neighborhoods. The staff of ARI has also participated in programs that teach students in the city’s public school system. One current project is working with the students at the Francis L. Cardozo Education Campus. ARI has also provided technical services to the University of the District of Columbia on an ongoing basis for many years. The following are examples of projects.
As part of the UDC community, the College of Agriculture, Urban Sustainability and Environmental Sciences, (C.A.U.S.E.S.) conducted their 7th Annual Green Living Expo DC alongside the 10th Annual Back to School BBQ on the Dennard Plaza. The two events provided meaningful experiences as the university explores how it and the local community can continue to collaborate in adopting sustainable initiatives beyond the Expo and in our everyday lives. ARI supported the event by displaying the Architecture Department student projects as it relates to designing green here in our nations capital.
The Department of Housing and Community Development, (DHCD) in partnership with the Greater Washington Urban League, hosted their Seventh Annual Expo and Home Show at the Walter E. Washington Convention Center. With support of the Architectural Research Institute, the event provided a wealth of information on housing and related topics. Over 3,000 attendees were projected to participate in this event.
The University of the District of Columbia, (UDC) and the Architectural Research Institute participated in the **Cardozo 6th Annual Industry Day Fair** and are excited about the contribution we were able to make to our students as they face future decisions about education and career pathways. It is a great opportunity to help develop the workforce of tomorrow with emphasis on **STEM** careers in aviation, construction, engineering, and technology industries.
ARI has donated time and efforts to harvest produce for the University’s Farming events at the Muirkirk Research Farm. The Center for Urban Agriculture and other centers are on a mission to fight food insecurity in the District of Columbia. In order to do so, a dependable supply of fresh nutritious foods can help support a healthy and active lifestyle.
The Architectural Research Institute has been given several projects to provide the University of the District of Columbia with architectural and technical support on a variety of campus projects for the academic year 2014-2015. The University has provided ARI with an opportunity to assist the university by providing a number of different services. Clarence W. Pearson, FAIA and staff members of ARI, have worked with campus services in all aspects of project activities including meetings with contractors, architects and OPM regarding a variety of projects. The following represent examples of proposed projects and current projects under construction.
A redesign of the IT department’s main office is intended to revitalize the space for students and employees. The new design introduces an “Apple Store” feel while maintaining functionality for IT staff to work freely and efficiently. The 800 sq. ft. design includes a Customer Help Desk, Waiting areas, Tier 1 & Tier 2 workstations, and additional storage with break areas; all ADA accessible.
The Nutrition Kitchen is designed to function as a useful Commercial Kitchen for teaching and training. It features a Commercial Kitchen and Produce Preparation areas, 15 Student cooking Stations, and a Demonstration Kitchen for on-hand demonstrations and lectures.
INTERIOR VIEWS
UDC ACADEMIC LAB CENTER FOR NUTRITION, DIETETICS AND HEALTH BLDG 44 LEVEL 1

INTERIOR VIEWS
The University of the District of Columbia, AES Muirkirk Farm with 143 acres, continues to promote environmental conversation, community engagement, and awareness. To maximize the impact of the farm, it is envisioned that a state-of-the-art sustainable research center will be constructed. This new facility will provide the opportunity for research collaboration, a working demonstration site, and renewed focus to expand the opportunities and use of the Muirkirk Research Farm.
PROPOSED UDC MUIRKIRK FARM FACILITY
Analysis of Images to Aid in Human Computer Interactions through Image Segmentation and Recognition

Mr. Michael Young and Mrs. Letasha McFarlane, University of the District of Columbia
Advisor: Professor LaVonne Manning, Department of Computer Science, University of the District of Columbia

Abstract

• Study in the field of HCI is crucial for observing the ways humans interact with computers, and designing technologies that let humans interact in novel ways.
• Image and Gesture Recognition is one such novel approach to alleviating the complexity of visual recognition in the field of HCI, and in particular the area of gesture recognition, which would enable sign language interpretation possible.
• Therefore we aimed to develop software that was capable of image manipulation and interpretation through detection and image segmentation. The methods presented involved Otsu’s Algorithm, morphological filtering, and histograms.

Morphological Filtering - Blur

Matlab Program

Conclusions, References, and Acknowledgements

• We have successfully created a program that can separate regions in an image and create binary images for further processing.
• Image recognition can be used for American Sign Language Gesture Recognition.

Recruitment Following Program
R.S.V.P. Mavis Johnson
202-274-5131 or mijohnson@udc.edu

SEAS Annual Honors and Awards Ceremony

April 23, 2015 @ 6:00PM | Bldg 38 2nd floor lounge

Speaker: Dr. Reginald Hobbs, Ph.D.
Water Resources Management Posters

Preparing Under-Represented Minority Students in STEM Fields: Rethinking a Summer Bridge Program

Tolessa Deksissa1, Lily Liang1, Pradeep Behera1 and Suzan Harkness2

1University of the District of Columbia; 2Stephens College

OBJECTIVE

Engaging and preparing underrepresented minority students in Science, Technology, Engineering and Mathematics (STEM) is crucial to meet the ever-increasing demand of STEM workforce. A number of studies identified that there is a relative shortage of U.S. workers with STEM skills. To address these challenges, bridging the gap between high school preparation and college access in STEM discipline is crucial in which an interdisciplinary summer bridge program plays an immense role. The objective of this study is to (i) assess the impact of hands-on innovative summer bridge course on student’s perceived significant learning, and (ii) assess the impact of summer program design and delivery method on student learning.

METHODLOGY

The study methodology includes: (i) design and implementation of innovative summer bridge programs and delivery method; (ii) course designed for junior/senior high school and incoming freshmen students; and (iii) implementation of the study in three consecutive years for three cohorts of students. For each of the years, the learning skills for students during the first two weeks of contact summer program included mobility and hands-on experiences in critical engineering design, collaborative and hands-on translating environmental quality analyses, advanced laboratory analyses, and field studies data analysis, scientific methods and communication.

RESULTS

Average percentage of students who responded agreed and strongly agreed with each of the 28 questions related to perceived learning goals is illustrated in the following figures (pro-cones in red box and pie charts in blue box).

DISCUSSION

• The longitudinal results show that students perceived learning goals varied from cohort to cohort. In particular, the 2014 cohort of students demonstrated stronger entry-level preparation, which may correlate to recent core curriculum changes evident in the DC public school system.

• What is the difference between the traditional and proposed summer bridge approach?

MATERIALS AND METHODS

Sample collection and processing

Soil sampling and sample processing

Sample preparation

Sample analysis using a XRad II "Viva"

Study area and sample sites

• 339 sampling locations
• 147 community gardens
• 257 home gardens

TAKE HOME MESSAGE

• Rethinking a summer bridge program crucial to attract and prepare underrepresented minority students in STEM disciplines.

• The proposed assessment does assess the change in student cognitive learning goals, but not human dimension goals.

• When students are enrolled without monetary incentives, the program improved not only cognitive learning goals, but also student’s learning how to learn goals.

• The results of 2014 is relatively the best in changing student learning, how to learn goals, which is consistent with concerted effort in advancing significant learning in students for DC public schools.

REFERENCE

Performance Study of Adaptive Filtering Algorithms for Noise Cancellation of ECG signal
Roussel Kamaha
University of the District of Columbia
Mellon: Dr. NHM Wong, University of the District of Columbia
E Sinn-Washington, DC February 2015

Introduction
Heart disease is major leading cause of death in the US. In many cases fatalities can be reduced if the diagnosis is made early. The reading of Electrocardiogram (ECG) is used to diagnose heart problems. However, in a resting setting, the principal technical issue in interpreting ECG waveforms arise from the existence of ambient or background “noise” emanating from other electromagnetic sources, generated by the other organs, muscles and systems of the body, whether from movement or the performance by those organs of their bodily functions, and signals generated by sources external to the body, such as electronic equipment, lights or engines. To effectively reduce this noise will allow cardiologists to more effectively diagnose patient with heart issue and help to save millions of life.

Problem
The objective was to develop a signal processing system to remove the contaminating electrocardiogram signal in order to better obtain and interpret the electrocardiogram (ECG) data. To achieve reliability, the real-time computing systems must be adaptive and fault-tolerant for noise cancellation of ECG signals.

Acknowledgments:
Dr. Nian Zhang who actively mentors me during this research.
Dr. Dixon, Ms. Wood, Ms. Taylor at UDC-STEM Center who without this research would have never been possible.

Methods
We built adaptive filter systems using neural networks toolbox in MATLAB to remove the noise from our ECG signal. The idea behind adaptive filters is that they can learn from the environment and modify their behavior according to the input signal. The first test the system without fault tolerance ability.

Results
The least Mean Squared (LMS) Algorithm
The LMS-algorithm is an iterative technique for minimizing the mean square (MS) between the primary input and the reference signal. The LMS algorithm can be written in matrix notation: W(n+1) = W(n) + 2αe(n)r(n)

Conclusion
The experimental results showed that the fault-tolerant adaptive filter is highly reliable to remove noise from an ECG signal.

Future research
In the future we will consider the implementation of this system using FPGA technology that possesses more power in parallel computation.

References:
J. A. Kors, and G.V. Horper. The Coming of Age of Computerized ECG Processing...
Jeffrey C. Bauer, The Future of Cardiology: Opportunities to Exceed Expectations, Bon Secours Health System, Inc., White paper, June, 2003...
ARI has participated, assisted, and constructed several safety training courses throughout the year:

- DDOE Training provider Meeting
- Inaugural 2 Day Lead Abatement
- Worker Initial - English course
- 2 Day Lead Abatement worker Initial – English course
- Total number of student taught – 19 during fiscal year (3) 2-day courses taught
- Approval by EPA to teach Renovator, Repair and Painting Course and Dust Sampling Course.
- MOU between UDC and Housing and Community Development used to train 17 students
- ARI participated in Healthy Homes training workshop sponsored by DC Department of Housing and Community Development and Lead Safe Washington (DCDHCD/LSW)
- Participated in all day fair, Lead Awareness and Healthy Homes Intervention Wellness Fair at Marie Reed, sponsored by DCDHCD/LSW
AFFILIATED NON-PROFIT ORGANIZATIONS

• Anacostia Economic Development Corporation
• Arch Training Center Inc.
• The Brandywine Street Association
• Manna
• Marshall Heights CDC
• MI CASA
• Peoples Involvement Corporation (PIC)
• Darnell Childs
• Habitat for Humanity
• Monseñor Oscar A Romero Cooperative/CARECEN
• Sergeant Memorial Presbyterian Church
• Cardozo Community Cooperative Association
• Brookstowne Community Development
AFFILIATED DISTRICT OF COLUMBIA CONTRACTORS

• Builders & Brokers
• C2 Development, LLC
• DC Habitat For Humanity
• DC Students Construction Trades Foundation
• Snider & Weinstein PLLC
• Horizon Hill Ventures, LLC
• Consys, Inc.
• 1031 4TH Street, LLC
• S2 Asset, LLC
• DC Housing Authority / CSA
• Micon Construction
• The Decca Development

• Keystone Plus Construction Corp
• Lawai Abulganiyu
• Manna, Inc. Mi Casa Inc
• MissionFirst Development
• Neighborhood Development Company
• Reza Fathi Sharbari
• Sakkar Siyamak Sadeghi
• United General Contractors