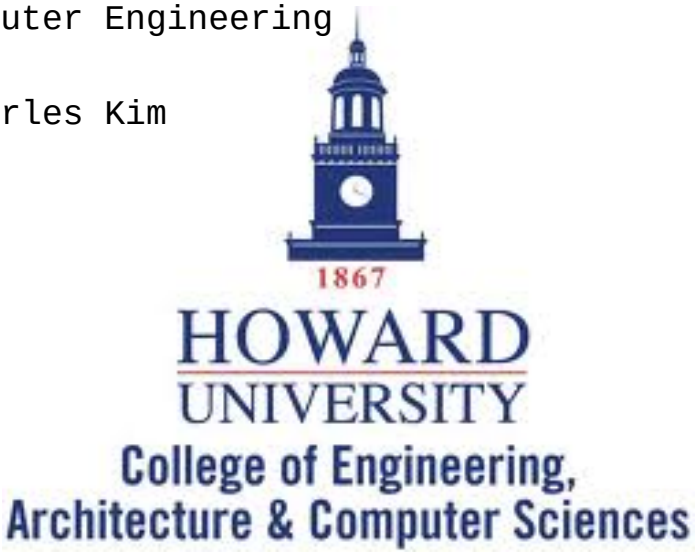
WWW.MWFTR.COM
EECE404 Senior Design II
Electrical and Computer Engineering
Howard University
Instructor: Dr. Charles Kim



Department of Electrical and Computer Engineering

Howard University

Senior Design Project:

Busboy Robot

Ibukun Osei _____ _____
Signature Date

Cecily Gomes _____ _____
Signature Date

Sarah Mwandu _____ _____
Signature Date

Caleb Davis _____ _____
Signature Date

Bethany Robinson _____ _____
Signature Date

Advisor name (printed)	Signature	Date

Class Instructor name (printed)	Signature	Date

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1. Introduction

1.1 Objective

In an age where what we want and when we want it is just a click away, expediency is a critical part of anyone's busy schedule. If there is a way to make life more efficient and easier we've found it. Bison Innovation's objective is to both conceptualize and produce an autonomous robotic system that is programed to do the following: move in a multi-directional manner; be able to maneuver around various obstacles; gather dishes/kitchenware, while not exceeding a set maximum weight limit, and return dishes to the kitchen, where they will be unloaded by a human. Sensors will be attached to the bus-bot, and will function as the means in which the robot will be able to both maneuver and avoid potential obstacles. Therefore, the bus-bot should also use the sensors to detect entrance and exit of the kitchen. Commencement of both research and lap-work will begin in October of 2013. Completion of the above-mentioned duties will be in March of 2014.

1.2 Background

There were various brainstorming meetings that we, Bison Innovation, had prior to meeting with our professor. It was in said meeting that he mentioned the bus-bot. The foundation and idea of the project was conceptualized by the previous senior design group, who were not able to fulfill their list of robotic tasks due to time constraints. However, we have been tasked to further build on their work by not only fulfilling their list of requirements, but also adding our own robotic tasks as well. With that being said, the idea of an autonomous robot appealed to the group. This was because upon doing further research into the robotic market there was a need for a service robot that produced a waiter-type function for its "master". For instance, currently on the market, and produced by IRobot, are the vacuum cleaning, floor washing, floor mopping, pool cleaning and gutter cleaning robots. Therefore, there is still an open chasm for the "bus-boy" type robots.

Furthermore, a service robot can function on a semi or fully automated level, thus capable of performing tasks for the betterment of humans and equipment (IFR). In being able to do so, an industrial robot must be able

transformed from commercial to in-home use. It is unknown whether or not service robots are fortified with an arm configuration as is the industrial robot. According to the International Federation of Robotics, the service robot has a mobile platform where an arm or several arms are attached and controlled in the same mode, likewise to the arms of the industrial robot. This means that the definition of a service robot is ambiguous. Another source cited that an autonomous robot can maintain a level of stability in motion, but it can plan its movements. Finally it has the capabilities of forward "thinking" in an "unstructured" environment without the need of continuous human coaching. With respect to our robot, it has previously been equipped with a bumper sensor, which detects obstacles. Moreover, it moves forwards and backwards in a straight line. Once there is a collision with an obstacle, the bumper sensor is pushed upon impact. The robot has already been programmed to retreat from the obstacle, and to make a right and then continue forward motion. This is in response to every type of collision with an obstacle. Our team, Bison Innovation expects to make the robot perform multi-directional capabilities, perform "bus-boy-like" takes (dishes to and from the kitchen), and lifting and the dishes in conjunction with making sure there is a set weight limit for load to be carried.

2. Problem

2.1 Definition

Howard University Senior Design Project (2012): The Autonomous Robotic Drop Table was proposed to manage time and complete functions to ease the workload of human service. The tasks given would get done more efficiently in several dining settings by such robot. Furthermore, this would eliminate a key component done regularly by humans and increase the overall experience for the customer. All of which are great attributes that we wish to continue and expound and whilst casting a layout for the robot to follow to increase efficiency for both the robot and the human as well. The problem statement is defined as;

The client would like a robot to navigate a preprogrammed environmental plane. Complete commands given to retrieve items and carry them from point A to B designated by the command given on the environmental plane.

2.2 Design Requirements

The design requirements will be formed by the constraints given by object and design competition that the design must adhere to in order to be functional and unique to our design. The design must have an interface that has a battery life up to 6 hours. In order to safely carry out duties it must function wirelessly, and must weigh between 30-50lbs in addition to the motor, battery and load carried. The bot will have dimensions of approximately 20” x 20” x 36” so that it is compact enough to not interfere with the atmosphere of the party, as well as allowing for easy storage. The robot will be moving from point A to B which is a command given before carrying out its objective. By giving the robot set constraints in regards to travel that will have consistent travel patterns so clients will know where it will travel to avoid collisions.

In addition to travel specifications, we will attach sensors to detect variable obstacles to activate commands such as; stop, slow down, reverse or re-route. The robot should be able to travel between 10 - 20 feet/second with respect to the minimum and maximum speed, and the machine should function with a noise level less than 20dbs at 1ft from the device, which is equivalent to that of a whisper. This robot will automatically shut it off the running temperature exceeds 90 degrees F. In one cycle (cycle – an active navigation from point A to B) the robot must be able to hold up to 30 pounds. It will be programmed to not accept any more dishes once the weight exceeds 28 pounds to account for some other some shift as the robot travels.

There will be a container integrated in the design that allows all liquid to drain into a basin without causing any damage to the wiring, and also allow for easier unload of the dishes while minimizing spills. Once the basin has reached ¾ of its capacity, a signal will show to alert the user that it needs to be discarded. All of these functions shall be assimilated into the design and produced with the well-designed final product.

2.3 Required Compliance

Our device must follow EMC standards as well as FCC part 15. It must be marketable and not interfere with the audio/visual systems of the party. It must not infringe on any patents previously created in regards to autonomous robots however some of the concepts can be used and refined to fit our prototype. It cannot be named after any other autonomous robots and/or their systems and must be unique with respect to all design constraints, appearance, and functionality.

3. Current Status of the Art

3.1 Available Devices

There are several personal-use robots on the market today that will do such things as vacuum the floor or pick up small objects. Although currently we are unaware of any such robot that can avoid obstacles in crowded settings while carrying heavy objects.

Hammacher Schlemmer has created "The Room Tidying Pick Up Robot". This robot picks up objects on your command then loads them onto its cargo bed. The robot will then empty the contents at your desired location. Additional, Willow Garage is a robotics firm located in Menlo Park, California that offered 11 teams of roboticists at 11 different institutions to take in a beta robotics project in June 2010. The teams will also be provided with free, open-source Robot Operating System (ROS) framework that controls the PR2. It also comes with software libraries for perception, navigation and manipulation.

3.2 Drawbacks of Available Devices

Several similar devices on the market complete tasks similarly, however the devices are not able to handle the specifications we want to implement. We did not find any such evidence that the Willow Garage teams were able to successfully create this robot. Also, the Autonomous Robotic Drop Table also did not plan to have an interface that gave specific constraints that were preprogramming for navigation commands before a task was given.

4. Engineering Approaches

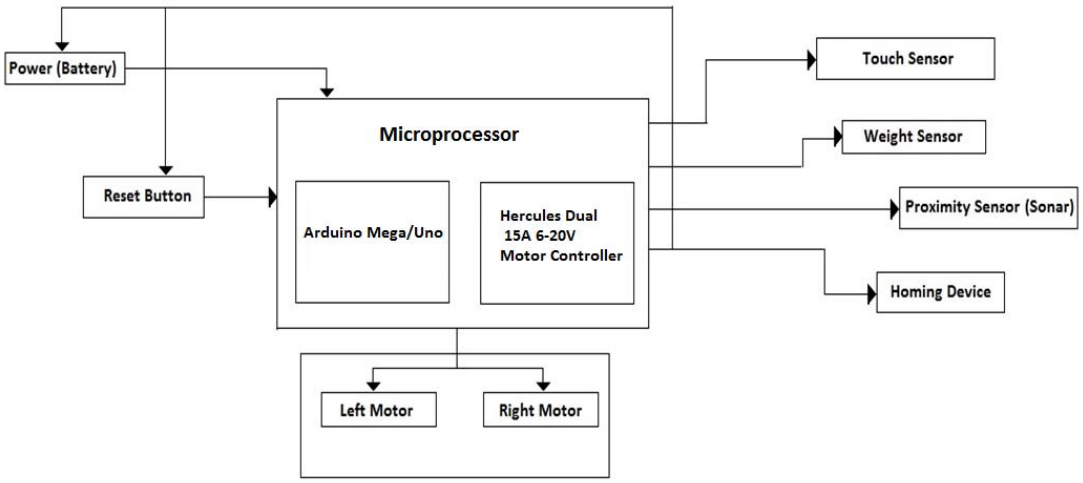
4.1 Solution and Expectation

The robot must be able to use sensors to sense its environment and develop a path to its destination for pick up. It must then be able to maneuver back to the home docking station. The robot should be able to run wirelessly for a time period of several hours on a single charge. We use an Atom Board Processor as well several different types of sensors to implement these abilities.

The robot will be equipped with a digital compass for navigation between the kitchen and the pickup destination and back. The robot will also be equipped with two sensors: a touch sensor and a sonar sensor. These sensors will enable the robot to detect and therefore avoid any obstacles. Specifically, the touch sensors will stop the robot from running into any obstacles, and the sonar sensors will notify the robot of close contact with an object. This will enable the robot to reset itself and continue on its desired route. The Atom Board Processor will act as the control. It will be equipped with a left and right motor, as well as a motor for forward and backward motion. The robot will also contain a battery and a reset button.

The robot will be equipped with a digital compass for navigation between the kitchen and the pickup destination and back. The robot will also be equipped with two sensors: a touch sensor and a sonar sensor. These sensors will enable the robot to detect and therefore avoid any obstacles. Specifically, the touch sensors will stop the robot from running into any obstacles, and the sonar sensors will notify the robot of close contact with an object. This will enable the robot to reset itself and continue on its desired route. The Atom Board Processor will act as the control. It will be equipped with a left and right motor, as well as a motor for forward and backward motion.

Final Schematic



4.2 Test Strategy

The robot will be built to specifications. A dinner service setup will be created to test the ability of the robot to maneuver through the landscape. We will test the ease of operation from the robot's docking station to a specified table for pickup and back. Necessary modifications and adjustments will be made after the assessing the robot's performance.

4.3 Alternative Approaches

Some alternative approaches would be to have the robot either directly human controlled or to control the robot wireless via Ethernet connection. There are several ways that this could occur. The simplest approach to complete human control would be to control the robot via Direct Wired Control, e.g. having the robot connected to a remote control. There are several advantages to this approach. The robot would not be limited to a maximum wireless operating time since it could be connected directly to the power supply. Possibility of loss of signal would be eliminated and the design would be much less complex. However, disadvantages of this method include the potential for the line to become snagged or tangled, thereby severing the line for control. The robot would also become limited to the distance of the cord.

The other approach would be to operate the robot through an Ethernet connection. This would allow the robot to be controlled through the Internet from anywhere in the world. The robot is also not limited to an operating time since it could use Power over Ethernet (PoE). Also, the Internet Protocol (IP) can simplify and improve the communication scheme. However, if this method were used, the programming of the robot would become much more complex.

5. Tasks and Deliverables

5.1 Tasks

(i)Tasks involving engineering solutions are more simply stated than achieved but are as follows:

- Hardware Design for the autonomous robot
- Hardware Building for the autonomous robot
- Software Design for all programming: including sensors, weight requirements, heat requirements, etc.
- Software implementation (i.e. coding for the atom board)
- Assembling of the entire autonomous robot both hardware and software

(ii) Verifying solution meets design requirements are being executed by respected team members. Though assistance may be granted for an individual by another team member each following member is responsible for:

- Hardware Design and Building
- Software Design and Implementation
- Assembling of the entire autonomous robot

5.2 Deliverables

As the team works diligently to complete the task at hand, the team will have a working autonomous robot available for the presentation of ECE Day. The finish product should consist of a demonstration in which the

autonomous robot will move around in a designated area in which a ‘simulated party’ is engaged. The autonomous robot will have dishes piled on top to prove its durability, while moving effortlessly around the party to prove is reliability and the team will also demonstrate its capacity to prove its accountability. The demonstration shall answer all question with the autonomous robot in which a sales representative will demonstrate a working product and have the product sale itself.

6. Project Management

6.1 Safety Issues

As a safe product is number one priority, the team will ensure that the autonomous robot meets all engineering requirements for any product on the market. The safety mechanisms put in place are described throughout the proposal with all talk of the designs. Safety such as the movement through the party, keeping of the dishes, and returning back to the party are all key.

6.2 Project Management

Project management

The primary challenge of project management is to achieve all of our project goals and objectives while honoring the preconceived constraints. Our primary constraints include completing our project within the scope, quality, budget, and time limits presented.

Scope: The work that needs to be accomplished to deliver our product, The Busboy Robot, is to incorporate motion sensors and detectors and a greater range of motion for the current model which is without sensor and only a forward and backward motion capability.

Quality: With the implementation of the engineering design process we will be able to ensure that our project comes to fruition in a timely, cost effective manner. Not only that, but it will be fit for its intended purpose. We seek to correct any mistakes that were made by the previous Busboy Robot team by fully

developing our project in terms of including a greater range of motion and motion sensors. We shall provide a user friendly product as well. Within our list of requirements, safety is our top priority.

Budget: Due to the nature of our project being a continuation and improvement of a past Busboy Robot, our resources are readily attainable. We have an initial model to use as a basis for the future prototype. The resulting budget will mainly consist of auxiliary materials that will include any parts that may be chosen to add to the hardware which will be provided by the professor and any additional sponsors.

Timeline:

November:

Our team shall continue to gather materials and plan the methods of implementation for our improved Busboy Robot.

December-January:

Our team shall move forward with our implementation methods and begin any software and hardware development required to complete our design project.

February:

Our team shall be finishing up any software and hardware design requirements and move on to the testing phase of our project.

March:

Our team shall test our project against the requirements we have set. Any tweaking of the product and error checking shall occur during this time period.

April:

Our team shall put any finishing touches on the project and ensure that it is working correctly with respect to the requirements and presentation.

6.3 Resources and Budget

Resources are already available for the team for which the team has a base design and materials for the hardware design for the autonomous robot. The budget will include additional materials such as sensors and any other hardware requirements the team doesn't already meet. Any other board purchasing may come from resources the professor and his sponsors may sponsor. The anticipated budget for the project is up to $500.

Team Name: Bison Innovation							
Project Title: Busboy Robot							
BOM (Bill of Materials)							
Part Description	**Part Number (Product ID)**	**Quantity**	**Unit Price**	**Priority***	**Shipping**	**Cost**	**Vendor**
Chassis	KIT06071P	1	169.99	1	17.8	187.79	Seeed Studio
Sonar Sensor	28015	1	29.99	2	11.41	41.4	Parallax
Weight Sensor	SEN-10245	1	9.95	3	4.52	14.47	Karlsson Robotics
Gyro Sensor	28526	1	29.99	3	0	29.99	Parallax
Homing Device	702	2	49.95	1	15.45	115.35	Pololu
Motor Control	2502	1	49.99	1	22.45	72.44	Vetco
Arduino Mega	276-127	1	63.59	1	0	63.59	RadioShack
Total			**339.86**		**461.44**	**461.44**	

7. Conclusion

Creating a Busboy Robot would be extremely beneficial, because the completion of this device can assist a user in minimizing a great deal of work that they would otherwise have to do. The Busboy Robot will be efficient in all respects: time, cost, etc. Although there is not a substantial need for this device, convenience and time is an amenity that humans strive for every day, therefore making the Busboy Robot a valuable device to purchase. From the design requirements that we have mapped out, the cost for the device to be constructed, and the timeline we have created, the Busboy Robot can be fully functional by the date the

project will be completed. Just as with any relatively new concepts there must be new and innovative ideas that have not been successfully implemented. We want this robot to be the embodiment of efficiency, so that other applications can be developed from this model.

8. References

http://science.howstuffworks.com/robot4.htm

http://mitpress.mit.edu/books/autonomous-robots

http://spectrum.ieee.org/tag/autonomous+robots

http://en.wikipedia.org/wiki/Autonomous_robot

http://www.hammacher.com/product/78568

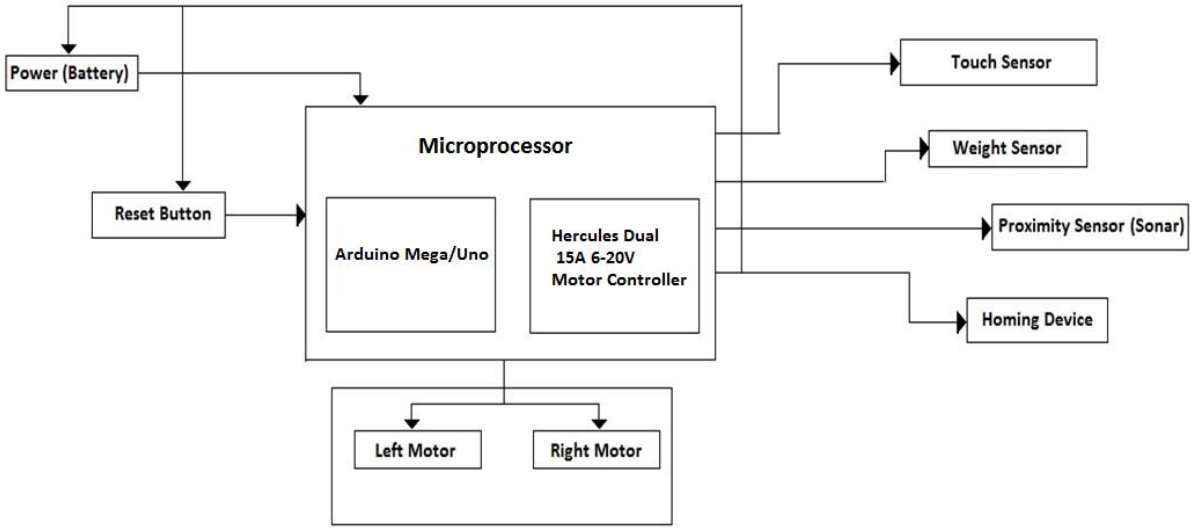
http://news.cnet.com/8301-13772_3-20004050-52.html#!

9. Appendixes

9.1 Final Design Requirement

In the final design of the Busboy Robot Bison Innovation created a machine that not only moves around autonomously using the sonar sensors and other sensors, but we also created a device that can find its way back to its home location. We have designed a product that has a payload of 40lbs and a battery life of 6 hours at max capacity. In choosing the IR beacons from pololu the Busboy Robot still complies with all FCC regulation while still being able to use a viable homing device. The final design of the Busboy Robot 2014ed is a major step in a complete BusBot project.

9.2 Final Design Proposal



9.3 Source Code

```
#include "DualVNH5019MotorShield.h"

DualVNH5019MotorShield md;
const int TrigPin = 22;
const int EchoPin = 24;

const int pin7 = 30; //Change pin number
const int pin6 = 32; //Change pin number
const int pin5 = 34; //Change pin number
const int pin4 = 36; //Change pin number
const int pin8 = 38; //Change pin number

void setup ( )
{
  Serial.begin(9600);
  Serial.begin(115200);
  Serial.println("Dual VNH5019 Motor Shield");
  md.init ( );
```

```
}
void forward ( )
{
    md.setM1Speed(100);
    md.setM2Speed(100);
}
void backward ( ) //
{
    md.setM1Speed(-100);
    md.setM2Speed(-100);
}
void left ( ) //
{
    md.setM1Speed(-100);
    md.setM2Speed(100);
}
void right ( )  //
{
    md.setM1Speed(100);
    md.setM2Speed(-100);
}
void stop ( ) //
{
    md.setM1Speed(0);
    md.setM2Speed(0);

}
void loop ( )
{
   long duration, inches, cm;

  pinMode(TrigPin, OUTPUT);
  digitalWrite(TrigPin, LOW);
  delayMicroseconds(2);
  digitalWrite(TrigPin, HIGH);
  delayMicroseconds(5);
  digitalWrite(TrigPin, LOW);

  pinMode(EchoPin, INPUT);
  duration = pulseIn(EchoPin, HIGH);

  // convert the time into a distance
  inches = microsecondsToInches(duration);
```

```
 cm = microsecondsToCentimeters(duration);

  //IR Beacon Begin
pinMode(pin8, OUTPUT);
pinMode(pin7, INPUT);
pinMode(pin6, INPUT);
pinMode(pin5, INPUT);
pinMode(pin4, INPUT);

int west, south, east, north;

digitalWrite(pin8, HIGH);
west = digitalRead(pin7);
south = digitalRead(pin6);
east = digitalRead(pin5);
north = digitalRead(pin4);

Serial.print("west =   ");
Serial.print(west);
Serial.print("south =   ");
Serial.print(south);
Serial.print("east = ");
Serial.print(east);
Serial.print("north =  ");
Serial.print(north);
Serial.println();
//IR Beacon Over

  //IR Beacon With Robot Start
 forward();
 if (inches <=5){
   right();
 }
 while (north != 0){
    if (west == 0){
      left();
    }
    else if(east ==0){
      right();
    }
    else if (south == 0){
      backward();
    }
```

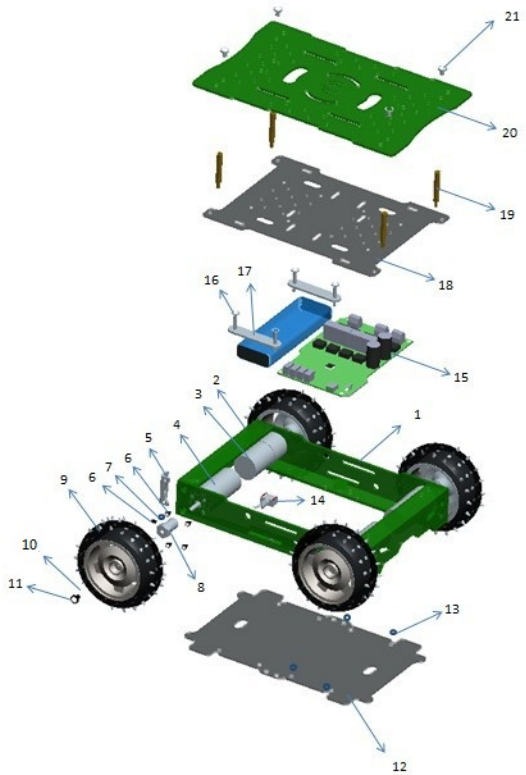
```
    else{
      forward();
    }
  }
//IR Beacon With Robot Finish
 }

long microsecondsToInches(long microseconds)
{
   return microseconds / 74 / 2;
}

long microsecondsToCentimeters(long microseconds)
{
   return microseconds / 29 / 2;
}
```

9.4 Design Detail

For the final design BisonInnovation used a Seeed Studio Skeleton Bot Hercules chassis along with four Hercules motor and a 12V battery. In conjuction with this chassis we also used a pololu 12A motor controller shield that is compatible with Arduino to control the direction of the two motors. As the control center of this device we used the Arduino Mega 2560 with parallax sonar sensors, a parallax 3-axis accelerometer, and a weight sensor. For the homing device we used a pololu IR beacon which works in pairs.



9.5
Resumes

Ibukun Osei
6917 Nashville Road
Lanham, MD 20706
240-432-3911
ibukunosei@gmail.com

Summary: More than three years of educational and hands-on experience in electrical engineering.

Education

- Howard University, Washington DC pursuing a Bachelor of Science degree in Electrical Engineering in May, 2014. GPA: 3.0
- Montgomery Community, Rockville, MD completed course work toward an Associate's Degree in Electrical Engineering

Course work includes:

- Power Communications
- Energy Conversions(Machines)
- Power Systems
- Network Analysis (Circuits) I & II
- Signals & Systems
- Computer Bus
- Microcomputer
- Telecommunications
- Digital Integrated Circuits
- Linear Controls

Experience:

Howard University Washington, D.C. *August 2013 – Present*

Undergraduate Researcher

- Worked with Signal Processing team
- Electromagnetic modeling radar data using FEKO
- Took radar measurements and recorded radar data

IEEE (Howard University Chapter), Washington, DC *August 2013 – Present*

Mentorship Chairperson

- Planning mentoring events
- Planning and running retention for students in engineering and sciences
- Managing all mentors

Army Research Laboratory Adelphi, MD *May 2013 – August 2013*

PIRT Intern

- Assisted hardware team in taking soil measurements using ring resonator and coaxial chamber
- Worked with Signal Processing team
- Used change detection to identify targets in SIRE data
- Took radar measurements and recorded radar data

One Day Program:

Parkland Magnet Middle School, Rockville, MD *May 18, 2012 & May 31, 2013*

Viva Technology, College Captain

- Mentored the students in the STEM program
- Helped students understand the correlation between their math and science studies
- Informed the students about the many careers in STEM

Computer & Special Skills

- NEPLAN, PSAT, Pspice, Mobile Studio, FEKO
- C++, MATLAB, FPGA, VHDL
- Proficient in Microsoft Word, Excel and PowerPoint

Other Skills

- Strong interpersonal skills
- Work well as part of a team
- Excellent public communication skills, both written and verbal
- Ability to accept guidance and supervision
- Competent, reliable, independent, and adaptable

Cecily J. Gomes

2251 Sherman Ave., NW Washington, DC 20001 ● 3051 N Louise Dr., Mobile, Al 36606 ● cecily.j.gomes@gmail.com ● (251)463-0426

EDUCATION Howard University, 2400 6th Street NW Washington, DC 20059
Expected Degree: Bachelor of Science in Computer Engineering
Cumulative GPA: 3.04/4.00 Expected Graduation: May 2014

EXPERIENCE

Jun 2012- Present **Enterprise Technology Services: Student PeopleSoft Access Administrator**

- Intern in charge of creating PeopleSoft profiles and distributing accesses to active employees
- Implementing row level security
- Rescinding employees' access to PeopleSoft database for security purposes

Jun 2011- Aug 2011 **Rensselaer Polytechnic Institute: Smart Lighting Engineering Research Center**

- Intern focused on a project dealing with Solid State Lighting, current LED systems packaging, and possible systems packaging for future implementation
- Researched possible implementations of self-assembly of LEDs for large system packaging
- Worked one-on-one with project manager to determine requirements and materials
- Implemented concepts of magnetic self-assembly in a laboratory environment, accounted for results, and presented on issues that arose and future work to be done

COURSE WORK

Senior Design I
- Fundamentals of design principles and engineering applications, design methodologies with analysis, synthesis and evaluations. The impact of engineering economy, ethics, and alternative solutions.

Microcomputer Design
- studied the workings of microcontrollers

Operating Systems for Engineers
- studied the workings of computer operating systems and introductory C and java

Computer Architecture
- studied principles of Instruction Set Architecture

Digital Systems II Lab and Lecture
- studied concepts of digital systems and their applications via VHDL

Electronics I Lab and Lecture
- studied principles of electronic circuits

Digital Systems I Lab and Lecture
- studied introductory concepts in order to better understand digital systems

Networks Analysis I Lab and Lecture
- studied introductory concepts in order to better understand electronic circuits

Computer Science II
- studied intermediate concepts of object oriented design and data structures in C++

Intro to Computer Engineering Lab and Lecture
- studied introductory concepts in order to better understand computer engineering

Intro to Electrical and Computer Engineering
- studied introductory concepts of electrical and computer engineering

PROFICIENCY

Language(s)
- X86 Assembly [***Basic***]
- Arduino [***Basic***]
- PBasic [***Basic***]
- LC3 Assembly [***Basic***]
- VHDL [***Basic***]
- Microsoft Visual Studio 2010 C++ [***Intermediate***]

Software
- Putty [***Basic***]
- Altera Quartus II [***Basic***]
- PeopleSoft [***Basic***]

Hardware
- BASIC STAMP-2
- Arduino Uno

Operating System(s)
- Windows-7 [***Basic***]
- Windows-XP [***Basic***]

AFFILIATIONS

IEEE Eta Kappa Nu (HKN)
Member of the Howard University Chapter

National Society of Collegiate Scholars
Member of the Howard University Chapter

National Society of Black Engineers
Member of the Howard University Chapter

Institute of Electrical and Electronics Engineers
Member of the Howard University Chapter and Student Mentor

Society of Women Engineers
Member of the Howard University Chapter

Sarah M. Mwandu

6515 Belcrest Road, Hyattsville, MD 20782 ● 412 Evans Ridge Terrace NE Apt E, Leesburg, VA 20176 ● mwichemwandu@gmail.com ● (571)315-9791

EDUCATION Howard University, 2400 6th Street NW Washington, DC 20059
Expected Degree: Bachelor of Science in Computer Engineering
Major GPA: 3.00/4.00 Expected Graduation: May 2015

EXPERIENCE

August 2012-present **CLDC (Computer Learning and Design Center) Administrator**

- Computer Operator and tasked with creating and maintaining student accounts
- Work on Assigned Projects (LDAP server on UBUNTU 11.10 and creating a router using old computers)
- General system maintenance of hardware and software in labs and help users with general issues (reset passwords, printing problems, security camera set-up)
- Make Ethernet cords using coaxial cables

July 2012- Aug 2012 & June 2013-August 2013 **National Science Foundation Mentorship Program**

- Set-up networking using JUNOS software
- Worked with JUNOS Software to learn how routers communicate with one another
- Worked with students on entry level college engineering (soldering, conversion of numbers (binary, hex, octal))

COURSE WORK

Operating Systems for Engineers
- studied the workings of computer operating systems and introductory C and java

Discrete Structures
- studied concepts of logic and set theory

Computer Architecture
- studied principles of Instruction Set Architecture

- **Senior Design**
  Studied the concepts of team work and team building skills while applying the sum total of all classes taken thus far

Digital Systems II Lab and Lecture
- studied concepts of digital systems and their applications via VHDL

Electronics I Lab and Lecture
- studied principles of electronic circuits

Digital Systems I Lab and Lecture
- studied introductory concepts in order to better understand digital systems

Networks Analysis I Lab and Lecture
- studied introductory concepts in order to better understand electronic circuits

Senior Design II
- studied the concepts of teamwork and team building, while learning how to implement a functioning product

Intro to Electrical and Computer Engineering
- studied introductory concepts of electrical and computer engineering

Computer Science I
- studied the basics of C++

PROFICIENCY

Language(s)
- Java [***Basic***]
- C [***Basic***]
- LC3 Assembly [***Basic***]
- VHDL [***Basic***]
- Microsoft Visual Studio 2010 C++ [***Intermediate***]
- Visual Basic for Applications in Microsoft Excel [***Basic***]

Software
- Putty [***Basic***]
- ArcTools [***Basic***]
- Altera Quartus II [***Intermediate***]

Operating System(s)
- Windows-7 & 8 [***Intermediate***]
- Windows-XP [***Basic***]
- Ubuntu 11.10 [***Basic***]

AFFILIATIONS

National Society of Collegiate Scholars
Member of the Howard University Chapter

National Society of Black Engineers
Member of the Howard University Chapter

Institute of Electrical and Electronics Engineers [E-Board Member]
Member of the Howard University Chapter and Student Mentor
Vice President [E-Board Position] 2014-2015

Society of Women Engineers
Member of the Howard University Chapter

Living Stones
Member of Howard University Chapter

Caleb A. Davis

calebaustin45@gmail.com – (512) 587-0594
Local Address: 117 W St, NW Washington DC, 20001

Objective:
Determined, analytical and team oriented individual seeking an internship in order to utilize my academic and professional skills. Committed to being a flexible and resilient leader capable of learning in fast paced work environments.

Education:
Howard University, Washington, DC
Bachelor of Science, Electrical Engineering — Anticipated Graduation: May 2015

Relevant Courses: Calculus 1 - 3, Differential Equations, Electronics 1 - 2, Electronic 1 - 2 Labs, Networks 1- 2, Digital Systems 1, Digital Systems Lab, Telecommunications, and Electromagnetic Theory.

Summary of Skills:

- Experience with NI LabView, NI CampacRIO, Rensselaer IOBoard Mobile Studio, PSPICE, Prezi, Unix, Linux, Maxima, C, C++ and Microsoft Office.
- Manage and consult several programs and projects.
- Website design using wix, wordpress & blogger.

Programming Languages:

- Experience with NI LabView, VHDL, MATLAB, PSPICE, Maxima, C, and C++.

Technical Experience:
FMC Technologies, Summer Intern **2014**

Global Education and Awareness Research Undergraduate Program GEAR-UP, *International Research* 2013

- Researched energy measurements in real-time with faculty and students at the Universidad Popular Autonoma del Estado de Puebla - México under the advisement of Dr. Casimiro Gómez González.
- Elected to present research at the NCUR and ERN National Research Conferences.
- Gained exposure through international scientific and engineering issues through enhanced course offerings.
- Designed a program for energy measurement in real time using LabView and CompacRIO

Howard University Computer Learning and Design Center, *Student Operator* **2012 – 2013**

- Responsible for the lab network setup for PC and MAC operating systems as well as link, application, modem, workstation, and printers in the system.
- Assisted users with posting entries to the World Wide Web, the restoration and repair of PC's and providing basic Internet training.
- Attended weekly Digital Media lectures to gain knowledge on developing technology of the future.

Howard University Smart Lighting Engineering Research, *Intern* **2012**

- Teaching Assistant to a class of 13 high school students while learning lighting, power and network systems.
- Led hands-on activities with the students and taught fundamentals of electronics and electrical engineering.

Howard University Nanoscale Science and Engineering Facility, *Research Lab Assistant* **2010 – 2011**

- Used lithographical equipment to do plasma etching and deposition on metals and measured step heights to collect information for future materials crafted on a nanoscale.
- Conducted experiments to research the efficiency of gallium as a substitute for silicon used by many semiconductors.

University Experience:
Howard University Student Affairs
- *Howard University Freshmen Leadership Academy, Member, Mentor & Co-Director* **2010 – Present**

- Wrote proposals for events including community service, international exchange, and charity.
- Raised over $90,000 to attend China for an international exchange and study of international leadership while serving as an ambassador of Howard University.
- Developed my critical thinking skills through case studies on numerous topics.

- *Office of the Vice President of Student Affairs, Undergraduate Assistant* **2011 – Present**

- Organized the office, answered phone calls, and completed other duties as assigned.
- Assisted clients to the Howard University Homecoming Parade and Freshman Leadership Academy.

- *Howard University Charles R. Drew Hall Student Assistant, Intern* **2011**

- Oversaw the operations of the Residence Hall.
- Supervised the Lobby Monitors and Housekeeping to insure productivity.

Professional Experience:
2012 - 2014 Martin Luther King Jr. Celebration, *Coordinator* **2011 – Present**

- Directed students at 6 volunteer sites for the Annual MLK Day of Service with over 200 volunteers.
- Collaborated with the parade planning committee to organize participants and volunteers in the MLK Parade in 2012.

Howard University Black Male Initiative: Howard Men United, *Founder, Director* **2013 – Present**

- Recruited and managed a team to conduct programs to empower, encourage and educate black men.
- Established a series of motivational and informational speakers and development workshops.

Awards & Honors:

Edmund & M. Pioleau Donor Scholarship	2013 – 2014
Best New Ambassador Award	2012 – 2013
Archis Alexander Trustee Scholarship	2011 – 2012
Consumer Energy Foundation Scholarship	2011 – 2012
United Technology Scholarship	2010 – 2011
Austin Alumni Chapter, National Society of Black Engineers Scholarship	2010 – 2011
Gamma Eta Lambda Chapter, Alpha Phi Alpha Fraternity Inc. Scholarship	2010 – 2011

Leadership & Extracurricular Activities:

Howard University Student Activities Fee Committee, *Appointed Member*	2014 – Present
Howard University Student Association Department of Alumni Relations, *Director*	2013 – Present
Howard University Yearbook Policy Board, *Chair*	2013 – Present
Howard University Texas Club, *Parliamentarian*	2013 – Present
Howard University Orientation Leader	2013 – Present
Howard University Student Ambassador	2012 – Present
7th Annual Winter Student Leaders Retreat, *Participant*	2013
Howard University Hilltop Policy Board, *Member*	2012 – 2013
TRUST: STEM Society for Men, *Founder, Member*	2012 – 2013
Howard University College of Engineering, Architecture and Computer Sciences Student Council, *President*	2012 – 2013
National Association of Student Affairs Professionals Student Leadership Institute, *Participant*	2012
National Society of Black Engineers Howard University Chapter, *Member*	2010 – 2012
Drew Hall Step Team, *Member, Coach*	2010 – 2012
Charles R. Drew Hall Dorm Council, *Vice President*	2010 – 2011

Bethany Robinson

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Baton Rouge, LA 70815

EDUCATION: **Howard University, Washington, DC**
B.S. Electrical Engineering • Expected Graduation: May 2014

EXPERIENCE:

FMC Technologies, Houston, TX
Topside Installation Intern, Summer 2013

- Field tested and installed controls equipment for deepwater Gulf of Mexico offshore operations
- Provided dock testing and total controls support for both green and brownfield projects
- Created and reviewed project documentation and deliverables both internally and for customers

Howard University Middle School of Mathematics and Science, Washington, DC
In-Class Intern, September 2011– May 2013

- In-class aide and tutor for 6 STEM classes and an aviation extended enrichment class
- Assisted in class instruction and activities, created supporting materials for class, graded assignments

NSF National Nanotechnology Infrastructure Network REU, Austin, TX
Undergraduate Researcher, Summer 2011

- Researched synthesis and characterization of graphene for use in graphene field effect transistors (GFETs)
- Worked in a team with 5 graduate students with assistance from a post-doctoral fellow

LEADERSHIP:

College of Engineering, Architecture, and Computer Science Student Council
Vice-President of Engineering, May 2013-Present

- Manage an executive board of 15 student leaders to execute several initiatives within the college
- Interface directly with the Provost of Howard University and the Dean of the College of Engineering on directives ranging from student retention to new curriculum development
- Serve as a representative and coordinator on the Undergraduate Student Assembly (UGSA) to plan and execute thoughtful and engaging programming for the entire university student body
- Represent the college on a university-wide policy board

Mentoring Program Coordinator, September 2012-May 2013

- Organized 150 freshman engineering majors into groups with upperclassman mentors leading each group
- Ensured that the mentors act as a resource and support system for the freshman
- Planned and executed monthly programs focused on leadership development, career planning, and study skills

National Society of Black Engineers (NSBE)
Pre-College Initiative Chair, August 2012-May 2013

- Developed and created lesson plans for a NSBE extended enrichment class for middle school students at Howard University Middle School of Mathematics and Science
- Partnered with 3 area middle and high schools to charter a NSBE Jr. program
- Plan programs locally to showcase different STEM careers and opportunities to children in the community

Parliamentarian, **August 2011–May 2012**
Pre-College Initiative (PCI) Committee Co-Chair, August 2011–May 2012

- Worked to establish a NSBE Jr. chapter at Howard University Middle School of Mathematics and Science

Howard University Louisiana Club
Treasurer, August 2011- May 2012

- Monitor and maintain club's budget, dues, and financial aspects of all events
- Create detailed financial analysis of all proposals for activities to be hosted by the club

AWARDS:

• NSBE Region 2 Technical Research Exhibition	2nd Place-Poster Presentation	November 2011
• NSBE Region 2 Technical Research Exhibition	3rd Place-Oral Presentation	November 2011

SKILLS:

- C++
- Certiport IC^3 (Internet and Computing Core Certification) Certified: Demonstrated proficiency in Microsoft Office Word, Excel, PowerPoint, and Publisher
- WonderWare and ControlLogix software and programmable logic controllers (PLCs)