THE NEW ORU

ENGINEERING NEWSLETTER
Summer 2010

GENIUS IS 1% INSPIRATION AND 99% PERSPIRATION - THOMAS EDISON

ORU ENGINEERING, COMPUTER SCIENCE, PHYSICS, AND MATHEMATICS GRADUATES OF 2010

2010 ORU Engineering, Computer Science, Physics, and Mathematics Graduates and Faculty

Eleven engineering students graduated this year, three students with summa cum laude, two with magna cum laude, and two students cum laude. Two computer science students graduated together with one mathematics education major and one mathematics major student with summa cum laude. Justin Mitchell was selected as Outstanding Biomedical Engineering Student. Jacob Garner was selected as Outstanding Engineering Student, Outstanding Department Student, and for Outstanding Engineering Research/Design Project together with Sherayah Vermette. David Kobilnyk was selected as Outstanding Mathematics Student and Martha Judd was selected for Outstanding Mathematics Senior Project. ■

2009 – 2010 SENIOR PROJECTS AT ORU ENGINEERING

ORU Formula SAE Racecar

Jonathan Luth and Brian Ostling: Formula SAE is a design competition hosted by the Society of Automotive Engineers. Students must build a prototype Formula-style racecar to sell to a fictional manufacturing company, to be evaluated for its potential as a production item. The target marketing group for the racecar is the non-professional weekend autocross racer. The teams are judged in a variety of on-track events as well as design and costing competitions. Not only must these vehicles perform reliably under race conditions, but they must be built and maintained by students. For this purpose, a suspension and frame will be designed and fabricated. The team will create this suspension using only basic machine tools. Additionally, a strict budget must be adhered to throughout the design and manufacturing process. The aforementioned constraints will be the driving factors for the design outside of vehicle performance. The design will cover mechanical and materials analysis in addition to basic dynamic analysis of the suspension as it applies to an FSAE race car. This includes loading analysis and various motion analysis using graphical and computerized methods. Motion analysis will include static conditions along with various dynamic conditions encountered in track racing. The resulting design will be compared to the final manufactured product and differences analyzed.

Nathan Pease and Kevin Stark: Oral Roberts University engineering students were approached by a Kenyan for-profit company, Dominion Farms, who wanted them to research and design methods for them to incorporate biogas production for their farm and

Biodigester for Third World Conditions

agricultural/vocational training center located in the Siaya district of Kenya. A team of two mechanical engineering seniors experimented with the batch method of anaerobic methane digestion and created a miniaturized continuous model diodigester and tested it using water. The students are preparing for an international development trip this summer in which they will implement their designs for a large digester for the farm and work with the farm staff to raise awareness of the benefits of biogas for household uses.

Aaron Allen, Justin Mitchell, and Venkatesh Kesanapalli: The KNEETM Process (TKP), a wireless electronic Range-Of-Motion system, tracks knee injury patient capabilities and provides an accurate, quantifiable, real-time medical analysis. Commercializing this technology equips doctors and therapists with a reliable means of improving patient recovery. TKP's mission is to maximize patient capabilities while minimizing medical related recovery costs. According to the American Medical Journal over 400,000 knee replacements are performed each year. According to a study by the injury attorneys Berman and Riedel, in the United States back injuries total around 6,000,000 annually. The identified problem: current medical technology neither accurately nor efficiently tracks patient rehabilitative health. Also, with the US government's mandate that all medical records be computerized by 2014, medical professionals will be looking for a convenient solution. TKP has developed mechanically functional prototype. The definition of completeness was to develop 'The KNEE Process'

for AaAI. TKP electronically tracks range of motion for use in physical rehabilitation procedures. The electronic data must keep an accuracy with <5% deviance from actual movement. The goal of the sponsor of developing a commercially viable product was not met, but a majority of the definition of completeness was met. The accuracy of <2% deviance was achieved by a proper selection of technology.

Less than 1 second away from a collision…

Timothy Bright and Oluwapelumi Idowu: This project demonstrates the ability of a vehicle to communicate effectively with another vehicle when a collision is about to occur while both vehicles are in motion. The Global Positioning System (GPS) provides and displays real-time position and location of the vehicles in motion and surrounding objects in its range. The Ultrasonic Proximity Sensor, in conjunction with the Fusion Brain microcontroller, provides the user with the distance an object is in relation to the sides of the vehicle. The implementation of the Wi-Fi in our project is to enable an easy and efficient communication network interface between laptops in the vehicles to improve safety on our roads. Supposing two vehicles were on a collision course, the activated timer predicts where a collision is going to occur ten seconds from the collision spot. The Ultrasonic Proximity Sensor alerts the driver of a vehicle when another vehicle is four feet away from its range. Also, our Wi-Fi ad-hoc communication works effectively because we implemented the server-client communication system which helps to send and receive data from the ad-hoc system using Visual Basic programming.

Jacob Garner and Sherayah Vermette: The purpose of this project is to design a system that is capable of locating and tracking a soccer ball during a normal soccer game. The necessary algorithms for this system accurately distinguish between foreground and background objects in a stream of video frames and are able to consistently detect which of these moving objects is the soccer ball. The system is aware of the position of the soccer ball at all times. The resulting data can then be used to control a camera that will cover the action of the game, or to analyze the game afterwards. ■

ALUMNI NEWS FROM ROSA RIVAS (2008 ENGINEERING GRADUATE)

At the NASA Marshall Space Flight Center in Huntsville, AL, I'm currently working in the propulsion testing area. The test stand that I was assigned is a component testing stand. Here, we can test different engine components and I'm specifically testing the gas generator for the J2X engine. What the gas generator does is provide hot gas so that the fuel and oxidizer turbopumps run in series. The gas generator has gone through 2 phases of testing and I am working on the third one. We are testing different lengths of piping and injector designs. I really have enjoyed working outside in the test stands, getting to handle the equipment and help putting it together. It is like a life-size lab class! What I'm most excited about is that I get to experience and work on testing that will be used for the final design of the J2X engine which will power the upper stages Ares I and Ares V launch vehicles. Basically, I get to be part of a great part of history and awesome legacy as Project Constellation tries to achieve its missions to Low Earth Orbit, the moon and ultimately Mars.

Rosa Rivas at the NASA Marshall Space Flight Center in Huntsville, AL

As for graduate school, I'm working on my MS in Mechanical Engineering at the University of Central Florida. I have decided to focus on the study of Thermofluids because some of my favorite undergrad classes were Thermodynamics, Heat Transfer and Fluid Mechanics. I'm also a Graduate Teacher's Assistant (GTA) for a Measurements course, so I get to play around with some cool equipment like supersonic wind tunnels and air flow benches. My favorite class so far has been Combustion. It was probably the toughest class I have ever taken, but definitely the most interesting. ■

ALUMNI NEWS FROM ROBERT JOHNSON (2008 ENGINEERING GRADUATE)

My two primary projects currently consist of dynamically testing rebuilt shock absorbers for Lockheed Martin Space Systems. This is done using a test platform which we have here, the design of which I manage and oversee. Many major changes to the stand have taken place which make the testing much faster, safer, and easier. These include installing a winch and pulley system to raise and lower the weights by simply pushing a button, re-locating the data acquisition trigger and linear displacement sensor, installing a way to test extension-type shock absorbers, and placing safety bars under the weights for when the stand is not in use or operators need to be beneath them. The other project I currently have is with the rotary dampers. We are currently in the final testing and qualification phase for Smoke Guard, who will be buying these dampers that I designed. Once this testing is complete, production will begin and design of the next model will start. ■