National Science Foundation (NSF)
Research Experiences for Undergraduates (REU) Site
Integrating Research in Sustainable Energy and the Environment across Disciplines (IR-SEED)

Texas A&M University-Kingsville

May 31, 2021 to August 6, 2021

Research Project List

Project #1: Assessment and Optimization on the Supply of Renewable Energy for Electric Vehicles

By Dr. Francisco Haces Fernandez, Assistant Professor, Dept. of Management, Marketing and Information Systems

i. Motivation: Electric Vehicles (EV) are considered as one of the main strategies to reduce mobile source air pollution all over the world, while additionally generating significant financial savings in fuel consumption. However, attempting to charge millions of new EV with existing electric grid infrastructure could overload the system or continue generating air pollutants if traditional electric generators are used. Supplying EV with electricity from renewable energy will help offset these challenges while generating a number of important synergic financial and environmental benefits.

ii. Project Description: Locations that have optimal conditions for the harvesting of wind and solar

materials, and fabrication methods, especially since 2012. 2) Take existing Rubber Muscle Actuator (RMA) and Pleated Rubber Muscle Actuator (PRMA) models, and compare them to determine if the PRMA at the same diameter and pressure, will produce more contractive force. 3) Develop a simple Excel-based model to predict the torque or transverse force that a BRMA or a BPRMA would exert, given an initial diameter, length, stiffener width, pressure and braid angle, 4) Design a new BRMA or BPRMA about the size of a human finger, 5) Explore new fabrication methods and materials, especially using FDM-type 3D printing for fabricating several BRMA and/or BPRMA 'fingers'. 6) Fabricate and test a bionic hand to demonstrate the viability of the designs and predictions, 7) Document results.

iii. Undergraduate Research Opptunities: Two undergraduate students will participate in this project to conduct different but related research activities. One student will focus on learning 1) how a Rubber Muscle Actuator works and its fabrication, and how it can be turned into a Bending RMA, 2) Design the w iig surergtll paf

Project #5: Estimating Effects of Land Use Change on Water Availability using Remote Sensing and Hydrologic Modeling

By Dr. Tushar Sinha, Associate Professor, Dept. of Environmental Engineering

i. Motivation: Several studies have shown that urbanization or increase in impervious area lead to increased stormwater runoff peaks, runoff volume, and higher risk of soil erosion, thereby increasing chances of localized flooding. For instance, Yuan and Qaiser showed that even gradual urbanization and densification from low to high intensity urban development could result in 10 to 19% increase in the peak flow. Changes in land cover and vegetation dynamics can alter interception storage, evapotranspiration, soil moisture and streamflow. Thus, changes in land use directly affect water availability, particularly in semi-arid watersheds. Thus it is important to estimate effects of land use change on water availability to update local and regional water supply management plans, which are typically updated once in every five years.

ii. Project Description: The overall objectives of this project is to quantify the effects of land use change between 1996 and 2016 on water availability in two selected watersheds in Texas. To accomplish this objective, changes in the spatial extent of land use will be determined using remote sensing and GIS analysis while the effect on water availability will be estimated using a widely used hydrologic model. Specifically, four major research activities include: 1) Georeferencing satellite-based land use data and classifying

ii. Project Description:This project is to investigate an outcome originated affordable cost-effective design procedure while considering the market availability of materials f