



College of Engineering



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A reinforced brick masonry column with polyester thread reinforcement strips Dr. Muhammad Saleem

<http://appft.uspto.gov/netacgi/nph-Parser?Sect1=PTO1&Sect2=HITOFF&p=1&u=/netahtml/PTO/srchnum.html&r=1&f=G&l=50&d=PG01&s1=20170284086.PG NR.>

Pullout apparatus and system for testing of anchor bolts/bars Dr. Muhammad Saleem

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Concrete reinforcement assembly, method of installation, and method to determine cyclic load response Dr. Muhammad Saleem

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Non-destructive apparatus, system and method for determining pull-out capacity of friction nails Dr. Muhammad Saleem

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Non-destructive apparatus, system and method for determining pull-out capacity of anchor bolts Dr. Muhammad Saleem

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Ultrasonic pulse velocity tester Dr. Muhammad Saleem

<http://appft.uspto.gov/netacgi/nph-Parser?Sect1=PTO1&Sect2=HITOFF&p=1&u=/netahtml/PTO/srchnum.html&r=1&f=G&l=50&d=PG01&s1=20180059062.PG NR.>

Water filtration apparatus and a method of using thereof

Dr.Loay Awad, Fawaz Ali Almuaddi (student), Mohammed Abdullah Alamri (student), Majed Mulfi Alotaibi (student), Badr Saleh Alzahrani (student), Talal Fahad Alotaebi (student), Abdullah Mazyad Alotaibi (student)

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جامعة الإمام عبد الرحمن بن فيصل
IMAM ABDULRAHMAN BIN FAISAL UNIVERSITY
كلية الهندسة College of Engineering

Department of Biomedical Engineering

Senior Design Projects

2018- 1439

Poster Presentation Day

April 18- 2018, Building A13 (9:00 AM to 3 PM)



Automated Closed-loop Intravenous Anesthesia Delivery Model using PID Controller

Students: Sara Alatrash; Layla Alawwad; Ala'a Alsaeed; Fatima Almughalliq; and Ala'a Alabdrabalnabi

Supervisors: Dr. Ibrahim Abdulrahman Aljamaan; Dr. Ibraheem Al-Naib

ABSTRACT

Anesthesia is applied to the patient by the anesthesiologist during the surgery to provide a temporary state of unconsciousness for the patient. Applying the anesthesia by the intravenous method is extremely critical and may result in severe complications if done improperly. Many of these complications can be avoided by applying and maintaining the correct drug dose. The main objective of this project is to ensure that the dose is within acceptable confidence interval from a set point. A Proportional, Integral, and Derivative (PID) controller is used to automatically control the delivery of the propofol anesthetic drug leading to the regulation of the depth of hypnosis state of anesthesia based on the patient's consciousness feedback from a bispectral (BIS) monitor. A simulation of the prototype is provided using LabVIEW.



Design and Implementation of Electrooculogram (EOG) Based Prototype System

Students: Reema Althabit; Hussah Alateeq; Fatima Alfilfil; and Atheer Alhamadi

Supervisors: Eng. Kamran Hameed; Eng. Sana Ijlal

ABSTRACT

Electrooculogram signal acquired from a bi-channel signal acquisition system and processed for its use in biomedical instrumentation systems. EOG signal has weak amplitude varies from 10 – 200 μ V, with frequency ranges from DC to 25Hz, which makes it very difficult to be acquired and processed. Moreover, the signal is interfered by many sources of noises surrounding the eyes such as face muscles, eyelid movement and blinking. Therefore, filtering and amplification was applied in order to get clear usable signal. In this project, we aim to empower people with disabilities, by enabling them to control their environment, using the movement of their eyes. Multisim and Arduino are used to simulate and process the signal.



Automated Temperature Controller and Monitoring of Infant Incubator

Students: Lana Altarteer; Alaa Aljumah; Kawthar Al Olaiwi; Hawraa Alnemer; and Alaa Almintakh

Supervisors: Dr. Abdul-Hakeem H. Alomari; Eng. Aysha Salman

ABSTRACT

Annually, an unacceptable number of infant deaths occur in the world, with premature birth being one of the major causes. A well-controlled thermal environment is crucial for survival. The incubator plays a vital role in taking care of premature infants who lack the ability to regulate their body temperatures on their own. In this paper, the purpose is to implement and design a closed loop control system with a PID controller that regulates the temperature inside a premature incubator. The closed-loop system implemented involves actuators and sensing elements that operate to provide a consistent thermal environment. Moreover, the developed incubator will rely on solar cell energy; therefore, it should be able to work, if electrical power fails. The microcontroller of the system is an Arduino mega2560 board that provides the efficient control of temperature automatically. The simulation results in MATLAB show a low settling time value of 363s as well as an acceptable overshoot value of 0.0638% that made the system stable.



Wireless Periodic Diagnosis of Some Vital Signs for Chronic Patients Using HARRE Drone System

Students: Ala'a Elesh; Eman Ateeq; Haneen Nayef; Reem Alfadhli; and Rehab AlZharni

Supervisors: Dr. Osama Albataineh; Eng. Bushra Melhem

ABSTRACT

Chronic diseases need a periodic examination so, the patient needs to go to the hospital regularly for diagnosis. With time, these visits become tiring to the patients. Therefore, HARRE system has been designed to find a faster and easier way for periodic examination of chronic disease patients. HARRE system is a wireless periodic diagnosis system which will be built inside a box attached to the bottom of a drone. This system is used as a communication bridge between chronic disease patients and doctors. It consists of three main parts: wireless periodic monitoring circuit, drone, and a medical phone application.



Microwave Imaging System Design Using Ultra-Wideband Antenna For Intracerebral Hemorrhagic Stroke Detection

Students: ALHanouf AlZamil; Fatimah Al-Alaiw; Fatimah Al-Janubi; Hind Al-Yahya;
and Wafaa Mohammed

Supervisors: Dr. Ibraheem Al-Naib; Eng. Sana Ijlal

ABSTRACT

Stroke is an impeded blood supply to some parts of the brain. The main types of stroke are ischemic and hemorrhagic. Ischemic stroke occurs when there is an occlusion in the arteries leading to the brain. Hemorrhagic stroke occurs when there is a rupture in a blood vessel inside the skull. In Saudi Arabia, 31% of stroke patients are diagnosed with hemorrhagic stroke. Computed tomography (CT) and Magnetic Resonance Imaging (MRI) are widely used for stroke detection. However, CT could be harmful with its high radiation dose over a long-period of time. Moreover, the time-consuming process and low sensitivity of MRI to identify intracerebral hemorrhagic (ICH) in earlier stage place actual limitations on its performance. In contrary, microwave imaging systems could be considered as an alternative or assistive tool to diagnose stroke. One of the key elements to build such a system is the part responsible to transmit and receive the microwave signal, which is an antenna. In this work, we adopt an Ultra-wideband (UWB) antennas for microwave imaging as it features compact size, low cost for implementation, and low power consumption. The aim of this project is to design a system using UWB antennas with a frequency range of 1- 4 GHz. The proposed system will be designed and tested to detect the ICH stroke using CST® software. Preliminary results show the possibility to design a compact antenna which function in the selected range. Currently, we are optimizing the geometrical dimensions in order to minimize the return loss. Later on, a realistic head phantom will be fabricated to test the validation of the designed antenna experimentally. The measurement data will be used to reconstruct the image using MATLAB® software. A comprehensive systematic study will be carried out regarding the sensitivity and the spatial resolution. In future, such a system is expected to complement the current modalities to detect the stroke.



Design of Flexible Textile Wearable Antennas for Medical Applications

Students: Bassmah AlAbdullah; Waad AlZahrani; Shahad AlGhamdi; Sara Nader; and Reem AlShuuwayer

Supervisors: Dr. Gameel Saleh; Eng. Ijlal Ateeq

ABSTRACT

In this Project, a flexible, textile, wearable antenna is designed for medical applications. The proposed antenna operates at a resonance frequency equal to 2.4 GHz, and fabricated over a felt, as a dielectric substrate. The antenna reflection coefficient (S11), electric and magnetic fields, far field radiation pattern, and finally the human body exposure to electromagnetic radiation will be investigated. The designed antenna, exhibited an excellent return loss of -42 dB, at the operating frequency, with Fairfield radiation pattern greater than 8.2 dBi. These results will be compared to the situation when a different phantom that emulates the human body hand is used. In this project, the patient safety is the main constraint since the antenna operates nears the human body tissues to communicate with any implant, such as pacemakers. The interaction of electromagnetic waves and the tissues as well as its effect on increasing the temperature of the tissues is measured using the energy Specific Absorption Rate (SAR). In the final manuscript, the peak SAR value on the hand phantom will be calculated to assure that it is within the engineering standards' limits (1.6 Watt/Kg, when calculated over 1-gram based of tissues) and as followed by the Federal and Drug Administration (FDA).



Accurate diagnosis of coronary artery atherosclerosis using image enhancement and virtual reality

Students: Saadia Talay; Huda Al-Mubarak; Amjad Aldarwish; Fatimah Alhamoud; and Noor Aljabr

Supervisors: Eng. Kamran Hameed; Dr. Mahbubunnabi Tamal

ABSTRACT

Coronary artery disease (CAD) is one of the leading causes of death worldwide. Accurate detection of the site and extent of atherosclerosis would facilitate complete and timely treatment of the disease and therefore the mortality rate. This project proposes a new method to improve the diagnostic accuracy of coronary arterial atherosclerosis by exploiting multiple techniques including nonlinear diffusion filtering, region growing segmentation, and virtual reality (VR) visualization.



Design of a Wristwatch as a precaution of the skin damage induced by UV and IR radiations

Students: Bashayer Al-Shehri; Haya Alumair; Israa Youssef; Lujain Alosaif; and Zenab Aljassas

Supervisors: Dr. Syed Mehmood Ali; Eng. Maha Alshammari

ABSTRACT

UV absorbed by the skin can drive photochemical reactions which range from sunburn to skin cancer. On the other hand, the repeated exposure to IR reduces the number of procollagen and collagen fibers in the skin resulting in premature skin aging or photo-aging. This project aims to design a protective measure in order to avoid these damages. The proposed protective measure is a wristwatch with audio alarm which is able to sense UV and IR radiations. These radiations are detected by UV and IR sensors and assigned, using Arduino, to an appropriate UV index and IR radiation level. Several reading was performed to collect sensors' data and program the alarm. A prototype was built using the two sensors, the LCD, the real time clock, and the alarm. The future work would be designing the real wristwatch and transferring its data to an application on a smartphone.



Wireless Blood Pressure Self-Monitoring System

Students: Fatimah Alshafei; Hadeel Alafif; Maryam Alalawi; Wala'a Alswiket; and Zahra Al Rabie

Supervisors: Eng. Ijlal Shahrukh Ateeq; Dr. Gameel Saleh

ABSTRACT

Mobile phone technology using wireless monitoring tools become widely available and positively affect healthcare awareness and clinical improvement. This project is designed specially to help individuals aware about their blood pressure level by giving an alarm in abnormal conditions. Additionally, the measurements are sensed non-invasively, transmitted wirelessly, and the results are presented in a mobile phone application. The first stage is designing the analog signal circuits using Multisim software and building them in the lab. The second stage is implementing the microcontroller circuits to control motors, record results, and alarm users by using Mega Arduino. The last stage is the transmission of results wirelessly to a mobile phone.



Smart phone: a cost-effective point-of-care (POC) medical device for non-invasive diagnosis of anemia.

Students: Meernah Al-Abdullah, Dana Alotaibi, Fatimah Najeeb, Mona Alhwaj, Noor Alhwaj,

ABSTRACT

Anemia is a condition that is generally caused by a lack of iron in the human body which leads to a reduction in the number of red blood cells. If untreated, iron deficiency anemia can make the body more susceptible to illness and infection since lack of iron affects the body's natural defense system (the immune system). It is thus important to treat anemia at relatively manageable stage before it can lead to more serious complication specially for pregnant women, babies and elderly people. The first step of managing anemia is to detect it as early as possible. At present, for detection and monitoring anemia, patients need to visit hospital or health care clinic to provide blood through the puncture of the skin at regular intervals which is invasive and painful. To facilitate the process of detecting and monitoring anemia as and whenever required, a point-of-care (POC) device for anemia detection using smart phone camera is proposed in this work. It is based on the principle that reflected monochrome lights with various wavelengths directed towards finger tips can be correlated with the blood hemoglobin concentration. One of the major limitations of the smart phone camera to be widely used as a point-of-care (POC) medical device for anemia detection is that each phone provides different colorimetric measurements. This proposed work also aims to address this issue by incorporating a chromatic calibration factor for each individual smart phone that would enable each smart phone model to non-invasively detect anemia accurately and precisely.



Generalized Tonic-Clonic Seizure Detection Using Accelerometer And Heart Rate Sensors

Students: Banan AlHarthi, Eman AlNattar, Fatimah AlDagdoug, Fatema AlKhabaz, Khlood AlHarbi

Supervisors: Dr. Ibrahim AlJamaan, Dr. Ebtisam Aldaais

ABSTRACT

Nearly 1% of the world's population suffer from epilepsy. The unpredictable nature of seizures entitles epileptic patients to danger, which emphasizes the need for a home monitoring seizure detection device. EEG provides valuable ictal data that is used in detecting the onset of seizure; however, most patients prefer a nonstigmatising wearable device. This project proposes a seizure detection device with an alarm system tested on different ictal data using accelerometer and heart rate sensors.



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Department of Civil & Construction Engineering

Senior Design Projects

2018- 1439

Poster Presentation Day
April 19 - 2018, Building A13 (10:00 AM to 2 PM)



Design of High-Rise Concrete Residential Buildings and Steel Structures

Students: Khaled Aldoukhy, Ibrahim Alsuwaidan, Rakan Alghamdi
Supervisor: Mohamed Elsharawy, PhD, P.Eng.

The project includes carrying out a complete design for two units, the first is for a 15-Story Residential Building and the second is a factory building with steel frames covering an area of (20x60m²). The steel building has a mobile crane with 10tons capacity.

The work has been started with the design of the residential building. The gravitational loads (i.e. Dead and Live loads) were first considered for the design following the ACI and Saudi Building Codes. The work includes the selection of the structural system, loads calculations, modeling and structural analysis. Furthermore, the Earthquake and wind lateral loads were considered in the design following the ASCE 7 and Saudi Building provisions. Foundations were also designed in detail. All the modeling and the analysis were carried out using CSI software programs (i.e. SAP, SAFE and ETABS) also well as hand calculations for validations. Then, the design of different elements was also carried out including conventional and ductile design of shear walls, columns, different types of slabs (i.e. solid, hollow blocks and flat slabs), and foundations (i.e. mat footing on piles). The output of the projects will be about 10 detailed drawings along with the final report. Similarly, the design of the steel unit will flow the same procedure; loads calculations, structural analysis and the design of different frame elements as well as foundations.



Design of Concrete Residential Buildings

Students: Abdullah Aloraifi, Emad Alhayek, Hamzah Alshateri, Saad Alenzi, Sulaiman Aldamigh
Supervisor: Walid Alkutti, Zaheer Kazmi

The project comprises of structural analysis and design of “Basement + 12 stories” hotel project, which is supposed to be constructed on dense sand with a bearing capacity of 150KPa. The total covered area of selected structure is 1880 m² for each floor.

The project was started with properly reading architectural drawings and selecting most appropriate structural system. The gravitation loads (dead and live loads) were considered in accordance with (ACI 318-14) and Saudi Building Code (SBC- 301-07) while lateral loads (earthquake and wind loads) are in accordance with UBC specifications. A flat slab structural system is considered for the adopted structure. The structural is analyzed and all the components (slabs, columns, foundation etc.) are designed using ETABS package. The software results are verified by manual calculations as well. The results are produced in the shape of structural drawings.

In the second phase, a relatively small sized industrial building will be designed as steel structure. The analysis and design will be carried out using FEM based commercial software and results will be produced as structural drawings.



Design of Concrete Residential Buildings

Students: Youssef Samody, Abdullah Reyad, Naser Eldin Bik
Supervisor: Dr. Sayed Mahmoud.

The project presents a structural analysis and design of a residential high-rise building with one bedroom, eleven floors and a roof. The main objective of the structural analysis and design is to produce a safe and economic structure capable of resisting all the applied loads in terms of gravitational and lateral loads without failure. The structural elements (slabs, beams, columns, shear walls, cores and supporting foundations) are analyzed and designed utilizing structural packages software as well as hand calculations. Structural analysis are performed to find out the system's internal forces which acts on the structural members. The analysis and design have been performed in two stages. The first stage has been carried out under only the applied Dead & Live loads which are calculated following Saudi Building Code (SBC301). In the second stage, the lateral loads (Earthquake and Wind loads) are then applied following the requirements of the SBC as well. The SAFE structural package software has been employed to design the horizontal elements in terms of beams and slabs where two types of slabs (solid and flat slabs) have been used within the floor of the high-rise buildings. Columns as vertical elements have been first designed under the applied dead and live loads for assigning the size and reinforcement bars for each column. ETABS Structural Package is then used to build the three-dimensional model of the high-rise building with the obtained cross sections of the horizontal and vertical elements. The lateral loads are then applied to the developed model assuming that the considered building is located in region 5 (Dammam province). Again the vertical elements are checked and designed to resist the applied lateral loads. SAFE are employed to design the foundation of the structure as a raft foundation rests on piles. Finally, the AutoCAD Software Package has been used to produce the structural drawings of all the designed elements.



Eco Friendly and Sustainable Lightweight Concrete Using Saudi Local Waste

Students: Meshal Nasser Alsaidan, Fawaz Saud Alharbi
Supervisor: Dr. CEng. A. B. M. Saiful Islam.

Enlargement of eco-friendly materials is a critical concern worldwide and in coastal region of the Arabian Peninsula at large. The coastal region is characterized as high ground water table and low bearing capacity of soil and aggregate. As aggregate constitute about 70% of concrete production, high concrete demand is a challenge for construction industry. The global market, now is seeking more in an environmentally friendly and sustainable solution for materials, in this study it is Lightweight concrete (LWC) or “Green Concrete”.

The main objective of this study is to develop sustainable and lightweight construction material using local waste aggregate like scoria and polystyrene, propose mix design by varying replacement to normal weight aggregate like crushed limestone. The mix designs were developed based on the physical properties of aggregate. The evaluated various concrete properties include workability, compressive strength, pulse velocity, sorptivity and rapid chloride permeability. The developed LWC material revealed good mechanical and durability properties with reduction in density. It is expected to hit the construction market and draw attention of the contractors, owners and investors in the Arab countries and any region having low quality soil or aggregate exist.



Determining the Most Cost Effective Approach for Remediating the Damaged Community Buildings in King Fahd Suburb Dammam

Students: Abdulmajed Al-Jabr, Abdullah Al-Thukair
Supervisor: Dr. Mahmoud Sodangi

Newly built residential and existing community buildings in King Fahad Suburb Dammam are being partially damaged due to excessive settlement of the supporting Sabkha soil. Experts recommended improving the ground using stone columns to minimize the settlement or changing the existing isolated foundation design to mat or raft foundation. Thus, in this project, two cost estimates will be developed for the two recommended approaches and cost comparison will be undertaken to determine the safest, most cost effective and sustainable approach. It is expected that the findings of this project could be useful for project developers and house owners in selecting the most the most sustainable approach that would yield considerable project cost savings and ensure safety of the building and its users.

Keywords: Cost estimate; consolidation settlement; community mosque building; King Fahd Suburb; soil treatment



Application of Construction Management Techniques on Two Primary School Projects in al-Khobar City

Students: Faisal Shafeeq Al-Nazer, Mohammad Abdullah Al-Sakkaf, Abdullah Nawwaf Alotaibi, and Mohammed Ghassan

Supervisor: Ahmed Fouad Salman, PhD

This graduation project focuses on applying construction management techniques on the construction of two Primary and prep schools project located in the al-Khobar City. Data for this project were obtained from contract documents (completed design drawings, bill of quantity and specifications), site visits, consultant and site engineer's interviews, and review of related literature.

In the 1st semester, the students focused on cost estimate, project budget form, and bid preparation for the two school buildings.

Currently (the 2nd semester) the group of the students is working on the following:

- planning and scheduling for the project using primavera 6 software
- S curve and cash flow
- resource histogram and resource leveling

Each student will select and apply one of the advanced construction management topics to work on (e.g., risk management, plan optimization, safety, cost & time control ...etc.).

1- Project Title:

An Asphalt Pavement Mix Design Using Available Aggregate in Eastern Province

Students:

Bader Saud AlRushaid, Ammar Hamad AlHammad, Shaher Tariq AlAnsari

Advisors:

Dr. Sami Abdalla Osman; Dr. Mohammed Abubakar Dalhat

Abstract:

Asphalt Mixtures is a homogeneous mixture of paving materials such as bitumen and aggregate of different sizes. Improving pavement performance is a complex and ongoing challenge. The researchers are working to address this challenge through experimental and theoretical works worldwide by utilizing additives to improve the asphalt mixture properties. The aim is to improve pavement performance, which means increased pavement durability and reduce life-cycle cost. This report presents experimental results and data on hot mix asphalt (HMA). Mechanical properties of aggregate from various source of eastern province of Saudi Arabia is being investigated. The variation aggregate properties with source and it effect on properties on HMA properties is being investigated.

Despite the expansion of the road network in the eastern region of the Kingdom of Saudi Arabia, but there is a phenomenon that legislates the attention of those interested in the performance of roads, which is the deterioration of the surface layer compared to the design age of the road, where can be found after a short time of construction of the road, that most of the defects of paving start to appear, especially holes, rutting and cracks.

Various aggregate tests have been carried out. Then asphalt mix has been desined and developed using different aggregate sources (from 10 sources) around the Eastern Province. Mix performance and properties such as: rutting, fatigue cracking, stability, density, air voids, voids in mineral aggregate, voids filled with bitumen, flow of mix all these properties have been tested and evaluated. Conclusions and Recommendations were generated based on the findings and reported. The conclusions come to answer this some important question that: why is the deterioration of roads in the eastern region compared to the age of design? Is the defect in the materials of mixture component? or in the climate factors?



Figure 1: Mix design preparation using different aggregate types



Figure 2: Marshall test to obtain optimum bitumen content

2- Project Title:

Development of a pavement condition assessment system

Students:

Ali Hassan Alahmed; Murtadha H. Albin Ahmed; Abdulrahman Abdullah Aldakhil

Advisors:

Dr. Wael M. Eldessouki; Dr. Sami A. Osman

Abstract:

Ride quality has been known as influence by pavement condition, but it is less clear how exactly pavement conditions are related to traffic crashes. Improving road safety through proper pavement maintenance is one of the goals of pavement management. Various studies results have been published examining the influence of road conditions on the accident occurrence and to characterize the correlations between different parameters of pavement engineering characteristics PCI, Skid resistance, PSI, and others compared with number of accidents.

The project aim is to design and develop a simplified system for pavement condition assessment to be utilized by stakeholders in municipalities and local authorities which will enable early detection of pavement distress and allow for preemptive actions that can avoid an expensive pavement rehabilitation in future.

The work focused on two types of distress. The first is road longitudinal roughness and the second is lateral rutting. Roughness is a condition parameter used to characterize deviations from the intended longitudinal profile of a road surface. Roughness data is typically measured with an Ultrasonic profiler installed into a purpose built survey vehicle. An IRI score is recorded for each section of road, and this data is averaged out over the length of each road segment. Road profile was measured by three Ultrasonic sensors combined with GPS recorder installed on one side vehicle that assist on calculating International Roughness Index (IRI) for the measurement of road longitudinal roughness. Measurement of lateral rutting is done by an installed camera and laser on the back of the vehicle combined with rotary encoder fixed on one of the back wheels. Captures taken every certain distance by camera along with image processing will carry out the calculation of the lateral rutting. The output of the system

will be compared with Ministry of Transportation (MOT) results and it will be represented visually through a geographic information system.

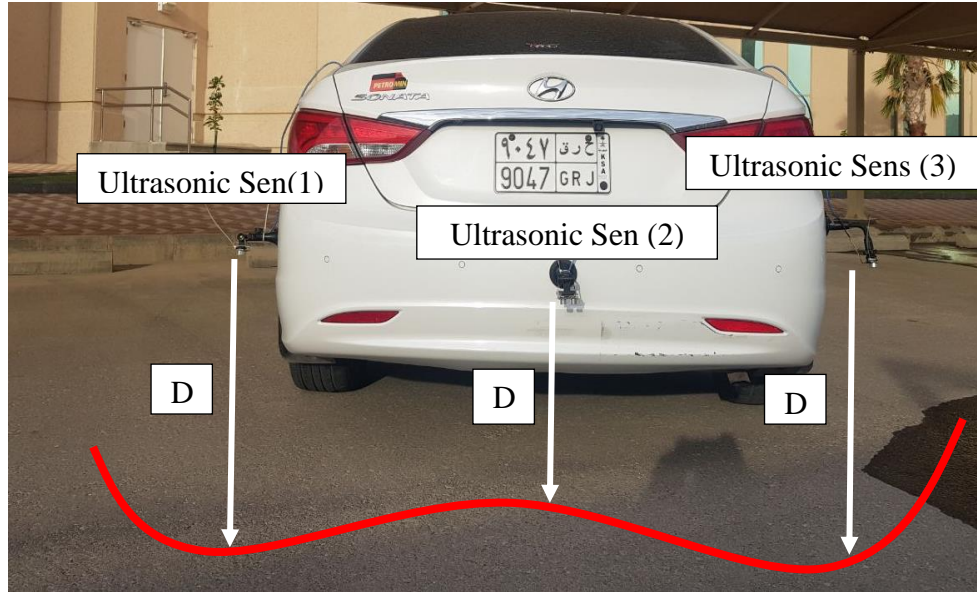


Figure 1: Rutting measurement by three sensors in the back bumper of the survey vehicle



Figure 3: Measuring rutting

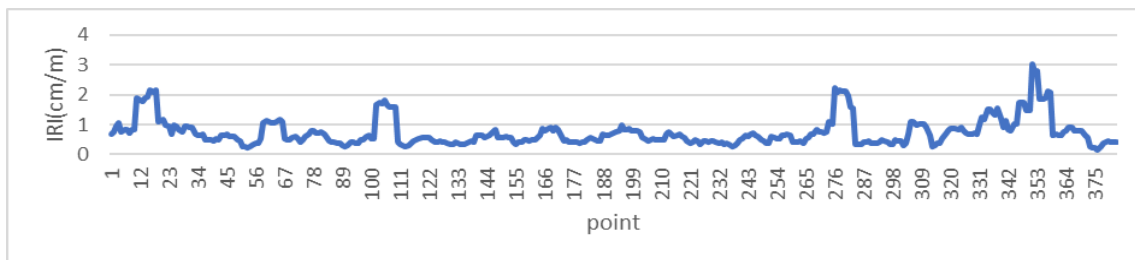
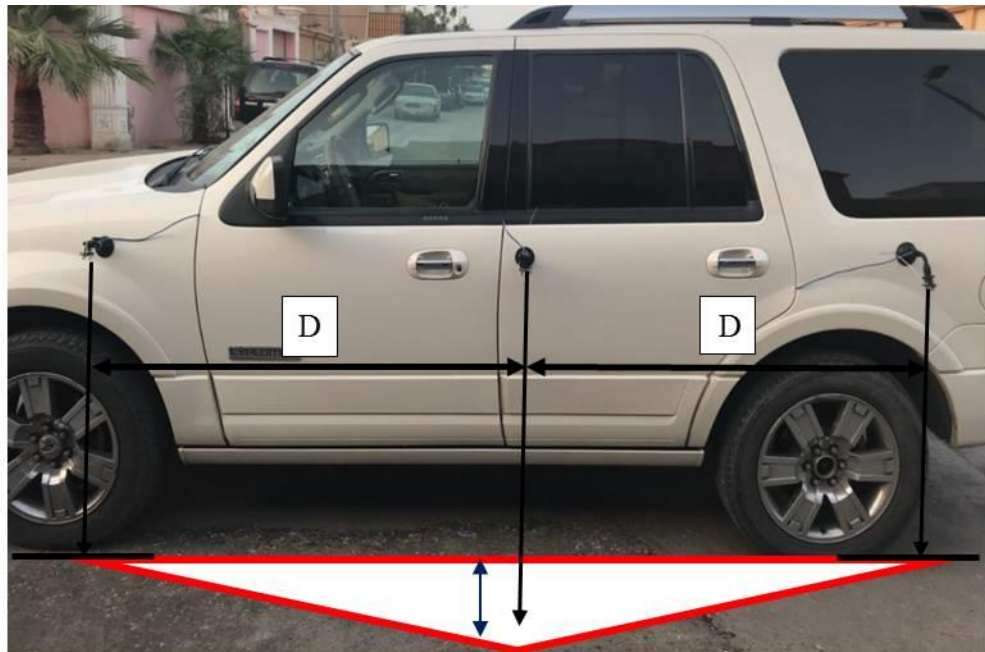
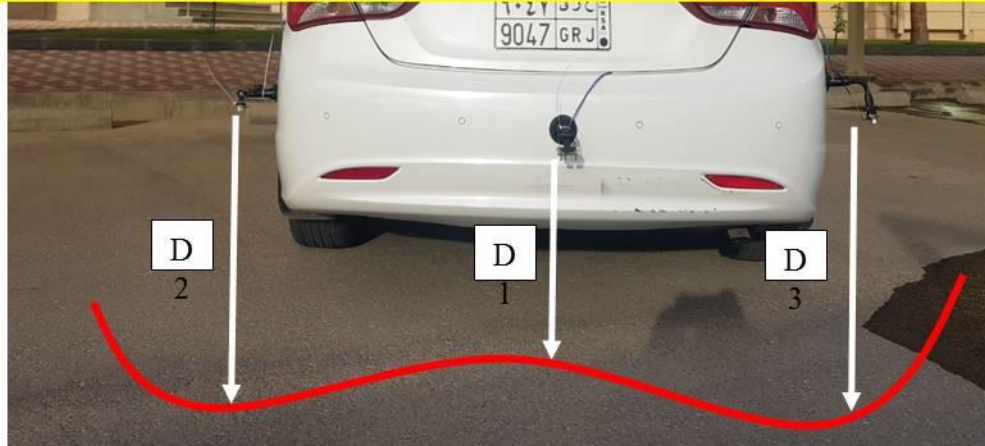


Figure 2: Roughness by ultrasonic sensor



Development of Pavement Assessment System



3- Project title:

IAU Female's Campus Al-Rayan Transportation Master plan

Students:

Abdullah Eldausry; Saleh Ahmed Alderah; Sami Albadiri Aljadaan; Mansour Alhallafi

Advisors:

Dr. Farhan Mohamme Butt; Dr. Ashaar Ahmed

Abstract:

Study of IAU Al-Rayan Campus master plan is being carried out for existing and future stage investigation of traffic movement pattern along Al-Rayan campus. The Campus is located at downtown of Dammam city with traffic demand coming from residential area, schools, and some market stores. Traffic volume data was collected near the vicinity of campus both inside and outside. State of the art simulation software “Vissim” was used to simulate both existing base model and future scenarios. A Validated and calibrated model was developed inside Vissim using traffic volumes, vehicle delays and travel time information from selected locations of the campus. For future scenarios, demand forecasting was carried out using survey questionnaires, building capacities and vehicle occupancy rates. For safety aspect, road safety audit was carried out along with auto turn software at major roads, intersections, and parking areas inside campus. This study showed improvements were observed in parking distributions and travel time along with the reduction in vehicle delays and congestions both inside and outside the campus.

4- Project title:

ROAD SAFETY AUDIT, RIYADH DRY PORT AREA

Students:

Ahmed Abdulhamid Almunif and Yazeed Farraj Alqahtani

Advisors:

Dr. Farhan Mohamme Butt; Dr. Dr. Sami, Dr Al Mojil and Dr. M. A. Dalhat

Abstract:

The project presents a comprehensive road safety audit (RSA) conducted for the Riyadh Dry Port and the roads in the vicinity. Riyadh dry port as part of port business attracts and produces a lot of freight trips to and from the port area. The trips include a good mix of traffic, most of it including freight trucks as well as some proportion of cars. The frequent movement of trucks and automobiles poses serious safety concerns especially with respect to design standards of transportation facilities in port vicinity. Riyadh Dry Port is a dry port in the city of Riyadh. It is the largest inland port in Saudi Arabia. The port is located on off Exit 16 in Al Malaz, adjacent to the Riyadh railway station. Riyadh Dry Port covers an area of 918,639 m² and accommodates six 6,480 m² warehouses. The main Objectives of the project are to: conduct a comprehensive RSA to identify design related safety issues and will suggest improvements as per standards (GCC\ASSHTO\HSM\MUTCD) and specifications; to analyze the causes of various traffic safety related issues and to provide recommendations for the improvement of the dry port area in terms of road safety. The scope of the works has been divided into four parts as: Road Safety Audit; Freight Movement design consideration; Geometric design consideration; Traffic sign and pavement marking consideration. As part of the RSA, assessment on offsets identified from design standards and specifications conducted for the dry port area including implementation strategies. This was done with regards to traffic crashes; some of the methods employed included collecting data on traffic volumes, speeds, travel times, traffic crashes, and conducting the road safety audit. These methods helped develop several countermeasures which targeted to reduce crashes and the severity levels associated with them, and hence improve the overall traffic safety situation in the area. For the pavement condition survey, it can be concluded that based on the PCI ratings: there are three very poor sections which are 1,4 and 9. Three poor sections which are 2, 3 and 6. And three fair sections which are 5, 8 and 10. And only one Good section which is 7. Therefore, to improve the dry port performance and pavement conditions quality of pavement must be considered first by

rehabilitation of the existing pavements, some section must be removed and repaved.
Also, consideration should be taken to pave containers yards with rigid pavement.

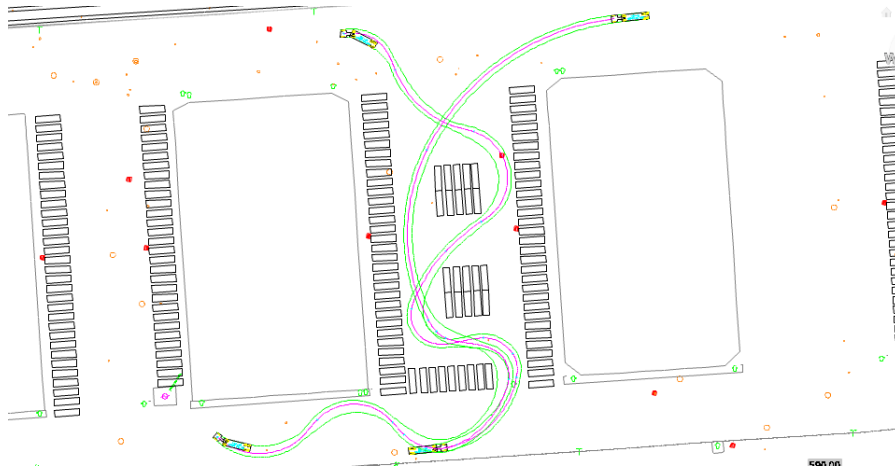


Figure AT-4

Figure 1: Trucks critical paths between storage buildings

Figure 1: Severe Rutting



Figure 2: Transverse and long cracking



Figure 3: Pavement failure in containers yard

Title: IAU Main Campus Parking & Transportation Master-plan

Students: Abdulmuohsen Alsaqyan, Ahmed Alarfaj, Maged Mtaafi, Soliman Alahmadi

Advisor: Dr. Wael ElDessouki

Abstract:

Master plan is a study which include designing and optimizing the future state based on data and analyses from the current situation. This Study will be focusing mainly on enhancing the transportation performance and evaluating the current and future parking needs. Imam Abdulrahman Bin Faisal University is one of the recent founded universities in KSA, it was a branch of King Faisal university 9 years ago, since that IAU is developing with high expectations. IAU Main Campus total area is around 3.3 Km². The next decade is promising for the university because there will be Large expansions and developments. Therefore, the future demand will expand as a result of the growth of the university. Moreover, a new traffic will be added gradually after allowing the female to drive. All the added traffic must be organized in future to avoid congestions and insure a smooth movement inside the main campus. The project aims to micro simulate the existing and the future situation by building a micro simulation model using PTV Vissim. The model should reflect the outcomes of the project and show simulation scenarios for the future expansion based on data calculated in the base year. Observing the future problems on the model gives the opportunity to recommend traffic solutions and show results. Females driving scenarios are taking a big part of the master plan because there will be a tremendous change in traffic and the future traffic estimation can't be estimated easily. In this study a Site Safety Assessment has been conducted to ensure the safety in the two campuses by evaluating geometric design of the existing roundabouts and speed limit enforcement. If The outcomes of this project is implemented the university's network performance will improve.



IAU Traffic and Parking Master Plan



جامعة الإمام عبد الرحمن بن فيصل
IMAM ABDULRAHMAN BIN FAISAL UNIVERSITY
كلية الهندسة College of Engineering

Department of Environmental Engineering

Senior Design Projects

2018- 1439





1. Design of Air Gap Membrane Distillation for Water Desalination

Students: Hassan Abdrabalrasool Alsadik; Marwan Mohammed Balharth,; Mostafa Mansour Alramadan

Supervisor: Dr. Habis AlZoubi; Dr. Fahad Alamri

Abstract

There is a growing demand for access to safe water sources, for both domestic and industrial use. The abundant availability of seawater makes technology for desalination processes increasingly desirable. Membrane technology is well recognized as the most convenient desalination technology. Among these processes, one can find air gap membrane distillation (AGMD) process that is applied also in desalination of seawater and brackish waters. MD is defined as a thermally driven process, in which only vapor molecules are transported through hydrophobic membranes. The driving force for the process is the trans-membrane vapor pressure difference, depending also on the temperature difference across the membrane. In AGMD, Stagnant air is introduced between the membrane and the condensation surface. The vapor crosses the air gap to condense over the cold surface inside the membrane cell. In this project, a design of AGMD system at Lab level for water desalination will be conducted. Moreover, different parameter such as feed temperature & flow rate, coolant temperature & flow rate, and feed concentration will be studied, and their effects on the performance of the AGMD system will be covered. Finally, a mathematical model for AGMD process including heat and mass transfer will also be investigated.



2. Design of wastewater treatment plant: the case of Imam Abdulrahman Bin Faisal University main campus

Students: Ahmad Mohammed-Abdullah Alkousa, Mohammad Abdulaziz Al-Nafisa,
Waleed Talal Al-Afif ,

Supervisors: Prof. Isam Abdel-Magid; Dr.Eng. Hisham I. M. Abdel-Magid

ABSTRACT

Engineering wastewater treatment plant design and its related units may be carried out manually or using pre-prepared design programs and software. Manual design is lengthy and time consuming. Available design programs usually are either costly or of restricted use. This project aims to develop an easy-to-use, simple, user-friendly and expandable calculation engine in the form of generating detailed spread-sheets to enable design of wastewater treatment units and components. In this regard, Microsoft Excel® was adopted in this research work for its capabilities of incorporating simple on-cell line formulas with embedded code-recording Macros; alongside more advanced programming by utilising VisualBasic for Applications (VBA) under MS-Excel. Design procedure and steps are set for each unit individually depending on input data parameters, governing design factors and related limitations. Detailed information and authenticated sources of wastewater, characteristics and influential parameters that are critical in the design stages and procedures are showcased to appeal the achievability of this research work. British codes of practice and design rules were adhered to in design calculations, plant performance and efficiency as well as operation analysis. The formulated calculation engines were tested and verified against both arithmetic and logical errors; by means of respective manual calculation follow-up and logical algorithms & flowchart representations. The final product is manifested with lexical explanations and screenshots of different software interfaces. Additionally, calculation output sheets were presented in their final reporting format.

Efforts done in this research work paves the road for further development and enhancement of the currently modelled wastewater treatment units and enables addition of more WWTUs.



3. DESIGNING AIR POLLUTION CONTROL STRATEGIES FOR INDUSTRIAL EMISSION AT DAMMAM: EMISSION INVENTORY, DISPERSION MODELLING, AND HUMAN HEALTH RISK ASSESSMENT APPROACH

Students: ABDULRAHMAN ALQAHTANI, ABDULLAH
ALGHAMDI and FOUAD ALMUAIWEED

Supervisors: Prof. Omer Aga, Dr. Ismail Anil

ABSTRACT

First industrial city in Dammam suffers from extreme pollution emissions that effect on the Air Quality and threaten the environment and public health. Many studies found out that the major pollutants are CO₂, PM_{2.5}, PM₁₀, SO_x, CO, and NO_x. This research study approach to find a sustainable solution that can control the emissions based on those pollutants analysis. AERMOD model is one of the dispersion modeling that is used for atmospheric dispersion of industrial emissions.



4. Multi-criteria locating and designing of sanitary landfill in Dammam Metropolis

Team Members: Abdulaziz Barjas Hmoud Albarjas; Abdullah Ahmed Matar AL-Essa and Mohammed Saeed Mohammed Bahitham

Supervisor(s): Dr. Nuhu Dalhat Muazu and Dr. Nawaf Blaisi,

Solid waste generation in Dammam has increased significantly due to the large increase in industrial population activities in addition to rapid urbanization. This was a major concern for the Municipality of Dammam because of the health problems associated with the proper disposal of solid waste. Thus, the landfill is the most common waste type for the disposal of different types of solid waste. Proper design of landfills is critical to ensure the safe disposal of solid waste to ensure adequate management practices to meet emerging environmental regulations. However, many aspects need to be taken into account in obtaining the appropriate location as well as the proper design of the landfill in order to ensure that environmental regulatory requirements and optimal service are met for cost-effectiveness. This project provides a design for MSW dumps to meet the needs of municipal solid waste produced in Dammam for 10 years. A multi-standard approach is used for the best engineering design principles based on the specifications and design models of various landfills such as, LandGEM and Web Design. Accordingly, the landfills and landfill gas and leachate generation, collection and control systems, as well as the coverage system, have been designed appropriately, taking into account the landfill stability.