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welcome

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Research News

IoT Geotechnical Data Mapping System for State of Pahang

Hokoku Engineering of Japan has awarded an international grant of RM 50,000 to Assoc Prof Ts Dr Muzamir Hasan from the Department of Civil Engineering for a project entitled "Development of IoT Geotechnical Data Mapping System for Pahang". Hokoku Engineering is a Civil Engineering-based company that specialises in land studies and geology in Osaka with branches throughout Japan. The success of this grant is the result of Hokoku Engineering's belief in the performance a project with the team from Japan previously. The results of the study from this project are expected to produce a geotechnical engineering data bank that can be used by the construction industry in identifying soil parameters at the site to be studied in Pahang.

Energy Auditing

Prof Ir Dr Ahmad Razlan Yusof
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A team lead by Prof Ir Dr Ahmad Razlan Yusof is working with a company called TT- Electronics (BI Technologies Corporation Sdn Bhd), Kuantan. The work includes accessing energy consumption in the production lines, heating, ventilation and air-conditioning (HVAC) systems using energy audit technique, and evaluating specific integrated energy consumption production lines with HVAC systems before estimating the potential energy saving in the company. Detailed analysis of power consumption for every busbar includes determining which busbar is the major contributor to higher power usage in the company. It also aims to rectify the major problem at the compressor that works below specifications by conducting CFM test to all compressors. The project is supported by MTUN industry matching grant of 104000 RM between UMP and Bi Technologies.

Electro-Chemical Coupled Computational Model for Border Zone Formation in Ischemic Heart

Dr Mohd Jamil Mohamed Mokhtarudin
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Dr Mohd Jamil Mohamed Mokhtarudin has developed a simulation model of border zone formation and evolution during the onset of Myocardial Infarction (MI), studying its effect towards early left ventricular (LV) remodelling processes by incorporating the oxygen concentration effect on the electrophysiology of an idealised three-dimensional LV through electro-chemical coupled mathematical model. Myocardial Infarction (MI) is the most common cause of a heart failure, which occurs due to myocardial ischemia leading to left ventricular (LV) remodeling. LV remodeling particularly occurs at the ischemic area and the region surrounding it, known as the border zone. This is the first computational study investigating the progression of border zone region in ischemic heart by incorporating oxygen model.

Research News

A Novel Microfluidics Seawater Desalination Kit

Prof Dr Hayder A Abdul Bar and his team are working on Microfluidics Kit for Simulating and Testing Blocked Vessels using Natural Additives. The initial idea for this work was based on the traditional directional solvent extraction desalination (DSE) which is a membrane-less method for seawater desalination where a partially-soluble solvent is used to extract water from the seawater. This method was not further investigated or applied due to two major fundamental issues. The first issue is the low mixing efficiency between the two partially-soluble phases, which will cause mass transfer rates reduction due to the low interaction surface area between the mixed phases. The second fundamental issue is the low separation efficiency of the two phases after mixing, where the gravitational force is used. Microfluidics technology provides an excellent opportunity to re-visit this desalination method and to address these fundamental problems by utilizing its unique micro-mixing and separation features.

The present work aims to elucidate the desalination mechanism on micro-mixing and separation effect in a membrane-less micro-scale system. A novel membrane-less microfluidics DSE chip will be designed, fabricated, and experimentally investigated. The present work also evaluates the micro-mixing and separation effects on the overall microfluidics desalination efficiency and investigate s the desalination mechanism in a micro-scale system. The chip will consist of two sections for micro extractive mixing (MEM) and micro separation. The MEM process starts by creating micro-droplets of the saline water flowing into the octanoic-acid medium, followed by a capillary separation section. The micro-mixer dimensions, capillaries numbers, mixing temperatures, and phases flow rates will be the main investigated parameters. Water product salinity was recorded to be as low as 0.056% (w/w) at 60 °C and 40 mL/h. A maximum water yield of 5.2% was achieved at 65 °C and 40 mL/h with a very low solvent residual (70 ppm). The chip mass transfer efficiency was recorded to be as high as 68% under similar conditions. The fabricated microfluidic desalination system showed a significant improvement in terms of water yield and separation efficiency over the conventional macroscale.

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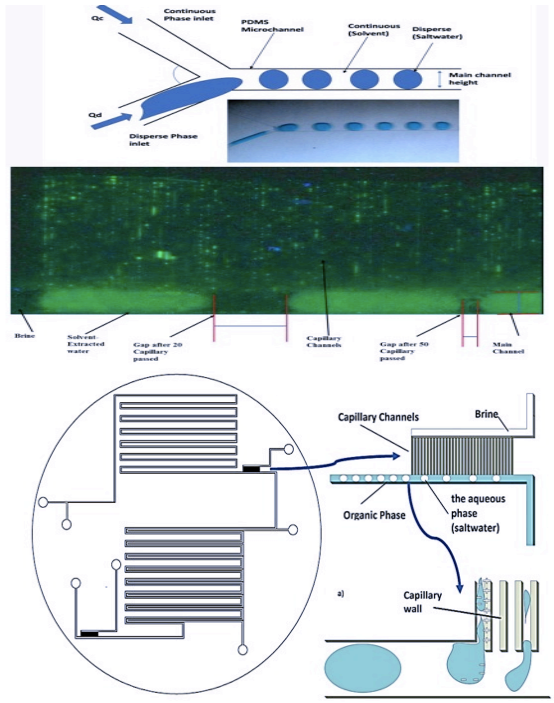
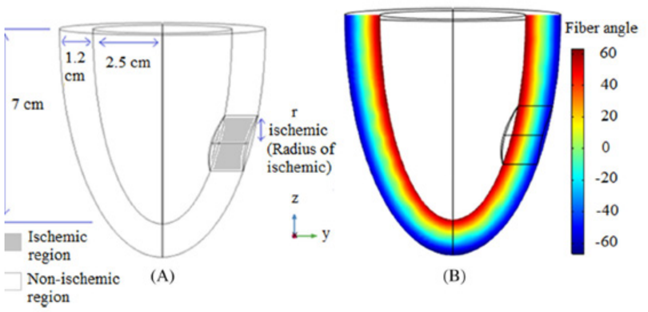


Sample pictures of research set up and mechanism



Left Ventricular (LV) geometry and dimensions. and Myocardial fiber distribution

The crucial role of the border zone in initiating LV remodelling process urges investigation on the correlation between early border zone changes (electrical conductivity) and remodeling outcome (irreversible myocardial injury that causes scar formation and deteriorate the LV function). The simulation result shows that the region of border zone, represented by the distribution of electrical conductivities, keeps expanding over time. Based on this result, the border zone is also proposed to consist of three sub-regions, namely mildly, moderately, and seriously impaired conductivity regions, with each region categorized depending on its electrical conductivities. This division could be used as a biomarker for classification of reversible and irreversible myocardial injury and will help to identify the different risks for the survival of the patient.