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ENHANCING QUALITY RESEARCH &
INNOVATION
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DEVELOPMENT**



P-1 Tuning Fork Type Ultra Wide Band (UWB) Antenna

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In this work a tuning fork type structure of Ultra Wideband (UWB) antenna is proposed. The antenna offers excellent performance for UWB system, ranging from 3.7 GHz to 13.8 GHz. The antenna exhibits a 10 dB return loss bandwidth over the entire frequency band. The rectangular patch antenna is designed on FR4 substrate and fed with 50 ohms microstrip line by optimizing the width of partial ground, the width and position of the feedline to operate in UWB. The rectangular patch is then modified to tuning fork structure by maintaining UWB frequency range.

P-12 Watermarking Technique Based on ISB (Intermediate Significant Bit)

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Digital watermarking is a special case of the general information hiding problem. It inserts a perceptually transparent pattern called watermark in an image called host or cover using an embedding algorithm. The purpose of the watermark is to supply the ownership of the image or copyright protection information. The energy of the embedded data should be low enough when projected onto the human perception domain but it should be strong enough for robust machine detection. Least Significant Bit (LSB) technique is the earliest developed technique in watermarking and it is also the most simple, direct and common technique. It essentially involves embedding the watermark by replacing the least significant bit of the image data with a bit of the watermark data. The disadvantage of LSB is that it is not robust against attacks. The aim of this study is to develop a robust watermarking model using spatial domain technique and at the same time maintaining important watermarking requirements of picture quality. The new model has been developed based on intermediate significant bit (ISB) aim to replace the watermarked image pixels by new pixels that can protect the watermark data against attacks and at the same time keeping the new pixels very close to the original pixels in order to protect the quality of watermarked image. The technique is based on testing the value of the watermark pixel according to the range of each bit-plane. The main contribution of this research is replacing the classic least significant bits (LSB) technique by a new technique called intermediate significant bits ISB, which improves the robustness and maintains the quality of watermarked images.

P-13 An Eco-Plastic Made of PLA-Kenaf Fibre Biocomposite for Cleaner Environment

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Every year more than 100,000,000 polyethylene terephthalate (PET) bottles are used in Malaysia, Singapore and Brunei. Out of this gigantic figure, 85,000,000 PET bottles end up as garbage and caused the landfills to be filled by the PET bottle toxic wastes that leach into the soil. This may pollute and endangers our environment specifically our drinking water.

This project focuses on the potential of kenaf fibre (KF) as a reinforcing material for poly(lactic acid) (PLA) biopolymer. PLA is a food grade plastic and kenaf fibre is a kind of natural fibre widely available in Malaysia. The fabrication of kenaf bast fibre reinforced poly(lactic acid) biocomposite is expected to be applied as food and beverages containers with the properties that are comparable to man-made based composite. The kenaf fibre content in the PLA was 5%, 10%, 15% and 20% by weight. PLA-KF biocomposite was extruded using Haake twin screw extruder then injection molded for further mechanical characterisation. The kenaf-fibre aspect ratio is 34. Single fibre tests shown that tensile strength and tensile modulus for KF are 119.6 MPa and 6206.1 MPa, respectively. Processing parameters have been

determined by using 10 wt% KF at temperature of 180°C and screw rotation of 150 rpm. The theoretical tensile strength and tensile modulus was also predicted by using parallel rule of mixture and the value then compared with the value obtained via experimental.

P-17 Lattice models with interactions on Caylay tree

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We consider an Ising competitive model defined over a triangular Husimi tree where loops, responsible for an explicit frustration, are even allowed. We first analyze the phase diagram of the model with fixed couplings in which a “gas of noninteracting dimmers (or spin liquid) — ferro or antiferromagnetic ordered state” zero temperature transition is recognized in the frustrated regions. Then we introduce the disorder for studying the spin glass version of the model: the triangular $\pm J$ model. We find out that, for any finite value of the averaged couplings, the model exhibits always a finite temperature phase transition even in the frustrated regions, where the transition turns out to be a glassy transition. On the other hand, In this investigation we studied one-dimensional countable state p-adic Potts model. We prove the existence of generalized p-adic Gibbs measures for the given model. It is also shown that under the condition there may occur a phase transition.

P-20 Socially Interactive Humanoid Head

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Due to rapid development of technology, robots are entering and influencing the human life into its social paradigm breaking out from its confinement within industrial applications. As a consequence, research on social robotics is on surge globally. Social robotics is a specific field of robotics where robots engage in interaction and communication with humans in ways determined by social and cultural norms of human society.

When humans interact with each other under collaborative conditions, the social regulation of behavior helps interactions go smoothly. Much of this social protocol relies on recognizing what task other people are attempting to perform and performing own part of the protocol in turn. One of the interesting and challenging fields is to put social robots at one end of this interaction. In this type of interactions, robots get engaged in interaction with humans evoking and exchanging emotional expressions. The crucial part is to understand, perceive and respond appropriately in the context of the environment they are operating.

To demonstrate the concept, a humanoid head is developed that can interact with humans exchanging emotional expression using the facial features just like the humans do. The problem of interacting with humans exchanging emotional expression is particularly challenging since it impossible to completely model the emotional states expressed by the human and they way they should be responded to. The task becomes more complex as different person express different degrees of expression in different emotional states and expects different response in reply. Planning actions for this type of interaction involves high level of uncertainty that must be taken care of.

The primary goal of this research is to produce a practically useful computational model of this interplay for the purpose of controlling an agent in socially situated tasks. More generally, this work suggests a novel approach to modeling and planning for a particular kind of multi-agent system: one in which self-interested agents pursue their own goals in a shared environment while following some set of guidelines for behavior. In most cooperative and many adversarial domains, the goals of the other agents are known.