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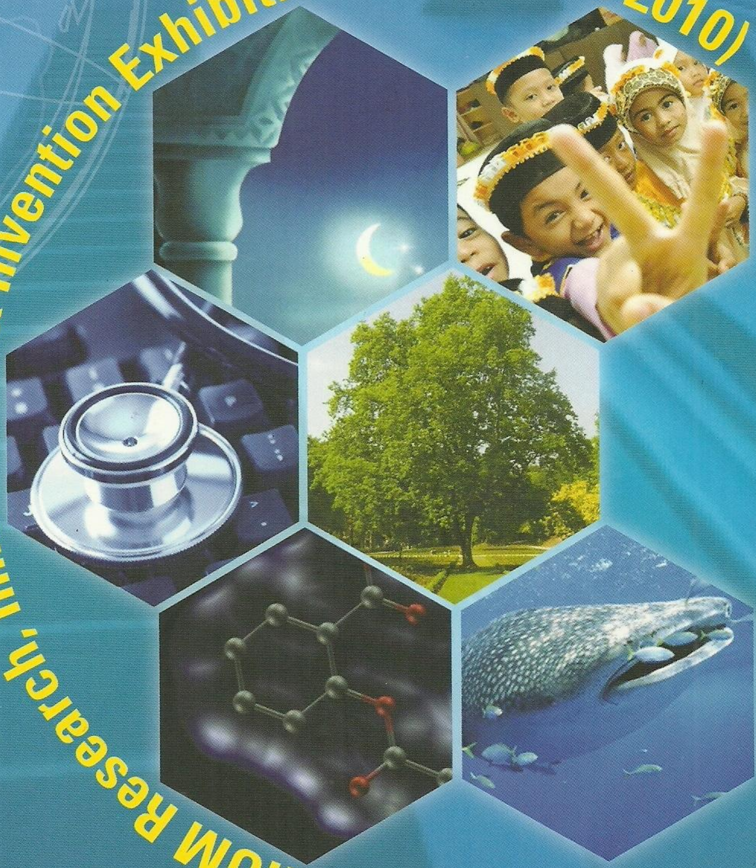

ENHANCING QUALITY RESEARCH &

INNOVATION for SOCIETAL DEVELOPMENT

PP-118 Intelligent Robust Control of High Precision Positioning Systems Using ANFIS

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Modern mechanical systems, such as machine tools, microelectronics manufacturing equipment, are often required to operate in high speed to yield high productivity. At the same time, precision/accuracy requirement becomes more and more stringent because of factors like the reduced size of components in modern mechanical devices or microelectronics products and high-quality surface-finishing requirements. High Precision Positioning System (HPPS) usually requires a good control to satisfy the requirement: robust high accuracy positioning and tracking performance at high speed, fast response with no or small overshoot and robustness to uncertainties. The development of robust control systems for HPPS is an attempt to provide guaranteed stability despite uncertainties and disturbances associated with the plant. However, robust control techniques require a dynamic model of the plant under study and bounds on modeling uncertainty to develop control laws with guaranteed stability. Although identification techniques for modeling dynamic systems and estimating model parameters are well established, very few procedures exist for estimating uncertainty bounds. A conservative bound is usually chosen to ensure robust stability, which will severely affect the high performance requirement of HPPS.

In this research an intelligent uncertainty function is developed to improve the robust stability and performance of H_∞ robustly controlled high precision positioning system in terms of reduced conservatism. The positioning system is identified, output performance and control signal requirements are controlled by proper selection of performance and control weighting functions, Adaptive Neuro Fuzzy Inference System (ANFIS) learns the uncertainty bounds of model uncertainty that results from unmodeled dynamics and parameter variations. The synthesis of the H_∞ controller will incorporate these weighting functions. Experimental results on a motion servo plant reveal the advantages of combining intelligent uncertainty identification and robust control. Improved performance is achieved.

PP-123 Development of Hand held Automatic Fruit Detection and Cost Computation

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Shape recognition and classification are large research areas in the field of image processing, computer vision and expert system development. Recognition is largely based on the matching of description of shapes while classification is based on grouping shapes with similar features. Lots of description techniques have been developed, such as Fourier descriptors, moment invariants, real-valued autoregressive technique and complex-valued autoregressive techniques.

In this work a new method of shape identification using parametric based autoregressive modeling techniques have been applied to the development of an automatic fruit identification machine. Fruit images are captured using digital camera while the image filtering stage eliminates unwanted interference and noise caused by use of digital camera. Segmentation stage classifies the image into two different classes while image detection and grading scale detect the fruit type and also compute the size and cost.

This device eliminates the unwanted error associated with cost computation in the hypermarket and at the same time automatically detects the fruit type and size. Accuracy of 96% has been obtained in using this developed machine to detect banana, mango, Pawpaw and oranges, thus contributing to the automation of hypermarkets for fruit identification purpose.