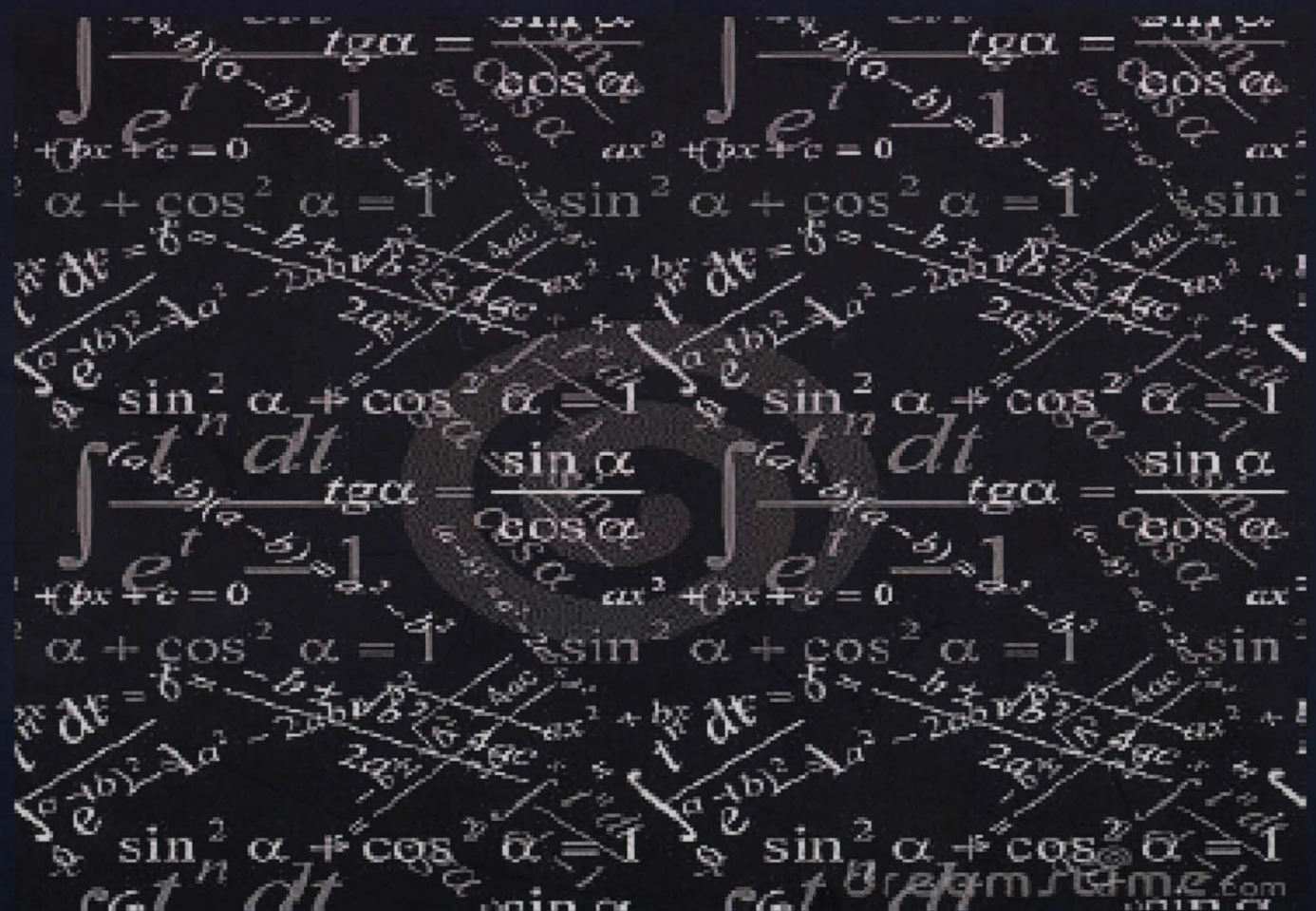




RECENT ACHIEVEMENTS IN DYNAMICAL SYSTEMS

Proceedings of Department of
Computational and Theoretical
Sciences, Faculty of Science, IIUM



Chief Editor : Farrukh Mukhamedov

Editors : Nasir Ganikhodjaev

: Mansoor Saburov

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ARTIFICIAL NEURAL NETWORK IMPLEMENTATION ON FIREARM RECOGNITION SYSTEM VIA RING FIRING PIN IMPRESSION IMAGE

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Abstract

Firearms identification is a vital aim of firearm analysis. The firing pin impression image on a cartridge case from a fired bullet is one of the most significant clues in firearms identification. In this study, a set of data which focused on selected 6 features of firing pin impression images before an entirety of five different pistols of South African made; the Parabellum Vector SPI 9mm model, were used. The numerical features are geometric moments of ring image computed from a total of 747 cartridge case images. Under pattern recognition theory, the supervised features of ring firing pin impression images were then trained and validated using a two-layer backpropagation neural network (BPNN) design with computed hidden layers. A two-layer 6-7-5 connections BPNN of sigmoid/sigmoid transfer functions with 'trainsecg' algorithm was found to yield the best classification result using cross-validation, where 98% of the images were correctly classified according to the pistols used. Moreover, the network was trained under very small mean-square error (MSE=0.01). This means that neural network method is capable to learn and validate well the numerical features of ring firing pin impression with high precision and fast classification results.

Keywords: *forensic ballistics, firearm identification, firearm analysis, geometric moment, backpropagation neural network (BPNN).*

Introduction

Crime has been the nuisance of humanity since time immemorial. The mass production of handguns and other firearms in the 19th century has further increased crime rates worldwide. In consequence, the necessitate to verify