

CELEBRATING  
COMMERCIALISATION  
YEAR 2014

# iiindex 2014

AN INTERNATIONAL EXPOSITION ON RESEARCH AND INNOVATION

invention  
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& design  
exposition 2014

INNOVATEUR  
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2014

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UNIVERSITI TEKNOLOGI MARA  
MALAYSIA

*Bridging  
the valley of death :  
advancing the  
commercialisation  
of research*

RESEARCH BOOK

# iiindex2014

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innovation  
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## FOREWORD

The Honourable Minister of Science, Technology and Innovation (MOSTI) has launched 2014 as Malaysia Commercialisation Year 2014 (MCY2014) with the theme Science Technology and Innovation (STI) for Wealth Creation. In line with this theme, Invention, Innovation, Design & Exposition 2014 (iidex2014) is an annual exposition organized by UiTM and is the ultimate platform to highlight and commercialise new inventions and innovations. Researchers and inventors will exhibit their products which cater to the needs and wants of the community and the country.

The iidex2014 creates a new dimension by fusing two competitive concepts, a competition among innovative products and a competition to invite Innovateur Wannabes to perform live pitching of their products to the audience. The iidex2014 focuses on comprehensive commercialization and creating opportunities for entrepreneurs to carry out R&D as well as to provide avenue to commercialise their products. Through expositions such as iidex2014, MOSTI hopes to inculcate the culture of commercialisation of new technology designed and created by Malaysians.

I wish to congratulate all the participants of the iidex2014 and this is the opportunity for all researchers to show their ideas and exhibits their products and creativity. Apart from showcasing their products, innovators will have the opportunity to provide a window to the industry for business matching during the exposition.

Tan Sri Dato' Sri Sallehuddin Mohamed  
Pro-Chancellor, Universiti Teknologi MARA

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## SYSTEM OF PORTABLE FIREARM ANALYSIS DEVICE (PAFAD)

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Forensic ballistics involves the analysis of bullets and bullet impact to determine information which could be used as evidences in a court or other parts of a legal system. Firearm and tool mark examinations (ballistic fingerprinting) involve analysing firearm, ammunition, and tool mark evidence in order to establish vital recognition, whether a certain firearm or tool was used in a crime. In Malaysia, there are not many experts in the arena of ballistics forensics. Therefore, this system is designed to recognize and classify firearms based on bullets found in crime scenes using Artificial Neural Network (ANN). It was found that using the supervised features of firing pin impression images, 100% of the images were correctly classified according to the firearms used. This means that neural network method can learn and validate the numerical features of firing pin impression images with high precision and faster result execution. Due to this the Royal Malaysian Police Force (RMP) may increase their efficiency and expertise in firearm detection relying on this system with confirmed accuracy and lesser effort. There are a few automatic identification system that have been invented, namely IBIS, CONDOR, ALIAS, FIREBALL and EVOFINDER which assist the investigators in making links to crime cases by comparing every characteristic on the bullets and the cartridge case images that have been captured in the current crime to the earlier evidences in the database (Smith, Cross & Variyan, 1995; Smith & Li, 2008; Geradts, Bijhold, Hermsen & Murtagh, 2001). Usually such task uses up great time constraint since it involves comparison with an enormous amount of existing evidences in the records established earlier and also the extensive amount of firearms to be matched. Problems normally surface whenever the investigators make wrong judgement using only visual inspection, also commonly named as human errors. It is also burdensome for these investigators as it is long-established fact that manual inspection necessitates careful planning and expertise. Therefore, the firearm cataloguing using numerical characteristics of the combined firing pin impression image in the feed forward back propagation neural network (BPNN) has become focal point of this project due to the artificial neural networks' (ANNs) efficiency and effectiveness in the areas of clustering and making classifications (Widrow, Rumelhart & Lehr, 1994; Saadi, Nor Azura, Liong & Aziz, 2010). This has been proven through the ANNs' adaptability to robotic, finance, medicine fields as well as social studies. In the initial study of this system, a two layer feed forward BPNN was used to distinguish five types of pistols. The two layers in the network consist of a computationally calculated hidden layer and a target output layer. In our previous studies - Saadi et al. (2010, 2011, 2012, 2013, 2014), firing pin impression has been proven to be adequate and efficient in firearm classification with 100% overall correct classification rate. The classification result observed in our research outperformed the result produced by Leng & Huang (2012). This means that the system developed by us for firearm recognition is expected to assist many practitioners who are involved in forensic ballistics.