RICES

RESEARCH INNOVATION COMMERCIALISATION & ENTREPRENEURSHIP SHOWCASE

2020

COMPUTING & INFORMATICS | DIGITAL CREATIVE & CINEMATIC ARTS

Cover design by Ms. Qistina Binti Ruslan.

RICES 2020 - COMPUTING & INFORMATICS | Digital Creative & Cinematic Arts

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FOREWORD

COMPUTING & INFORMATICS | Digital Creative & Cinematic Arts

FOREWORD

Vice President, RICES 2020

RICES 2020 is one of the numerous publications, including journals that MMU Press takes pride in. I am truly pleased that MMU Press have embarked on the initiative to publish this book.

Despite the global pandemic, the event RICES 2020 was successfully organised virtually, showcasing a multitude of exhibits reflecting research, innovation, commercialization and entrepreneurship activities and achievements. The RICES 2020 book is an extended compilation of MMU's researchers and entrepreneurs' fascinating insights on research ventures and idea creation for commercialising research output as well entrepreneurship. RICES is an excellent platform for MMU to interact with internal and external stakeholders. These interactions enable researchers to realise potentials for collaborations, IP exploitations, commercialisation and further research. It allows for industrial related viable research and feasible output. This RICES 2020 publication extends the present interactions even further, allowing for post-event interactions to materialise beyond the existing valued stakeholders.

RICES 2020 is evidence of the excellent effort by the RICES 2020 organisers and MMU Press. Their commitment and dedication have paid out with another hallmark achievement reflecting the division's synergy in the development of Research-Innovation- Commercialisation-Entrepreneurship (R-I-C-E) nexus in all research activities. I look forward to RICES 2020 publication.

Thank you.

Prof. Ir. Dr. Hairul Azhar bin Abdul Rashid
Vice President, Research and Industrial Collaboration and Engagement
Multimedia University

FOREWORD

Director, RICES 2020

On behalf of the Committee, it is my great pleasure to welcome you to RICES 2020, the fourth Research, Innovation, Commercialization, Entrepreneurship, Showcase. RICES is an annual event organized by Multimedia University to showcase research innovations, commercialization and entrepreneurship. RICES 2020, with the overarching theme of "Humanizing Innovation," is being held virtually on December 9-10, 2020, allowing for a borderless audience and safe interaction among inventors, venture capitalists, and industries in the midst of COVID-19. It is about ensuring that the results of research and innovation contribute to positive changes in people's lives, society, industry, and the country as a whole.

RICES 2020 pioneered the use of Virtual Reality technology to elevate the virtual exhibition experience by transforming in-person perspectives into an interactive and immersive virtual experience. For the first time, RICES 2020 hosted a virtual conference, disseminating the most recent research results and findings for researchers and academics to discuss. This year, 194 projects were accepted for presentation at RICES 2020, distributed across Project Showcase (Research Project, Social Innovation Project, and Startups), Embedding Entrepreneurial Learning, and Conference. Both internal and external judges who evaluated the showcases had used the judging criteria similar to those set for international exhibitions such as International Conference and Exposition on Inventions by Institutions of Higher Learning (PECIPTA) and International Invention, Innovation & Technology Exhibition (ITEX).

I would like to express my heartfelt gratitude to the organizing committee and everyone who helped make RICES 2020 a success in various ways. Last but not the least, I would like to thank everyone who submitted work and participated in RICES 2020.

Thank you all for contributing!

Mr. Cheong Soon Nyean
Director of RICES 2020
Deputy Director, Technology Transfer Office
Multimedia University
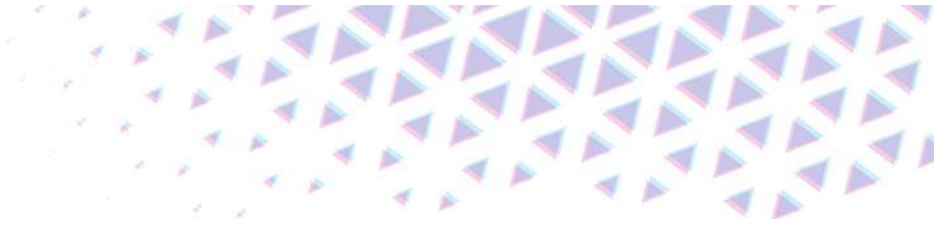
FOREWORD

Deputy Director, RMC
(Head, MMU PRESS)

I would like to humbly thank various people who made MMU Press publications a success especially in its RICES publications 2020. Congratulations to Mr. Cheong Soon Nyean, Director of RICES 2020 who has successfully organized the event despite the Covid-19 pandemic. The RICES 2020 hosted the Virtual Reality technology to ensure all participants and visitors immerse into this virtual experience and making the participation almost possible for everyone.

On top of that, RICES showcases the best technology, research innovation, R&I commercialization, receives valuable feedback and develops new partnerships that bring great value to society. MMU Press is proud to have produced a total of 5 publications in 2021 namely research on (i) Engineering, (ii) ICT and Multimedia (iii) Social Science, (iv) Entrepreneurship & Social innovation projects as well as (v) RICES Conference Extended Abstract.

It is our utmost hope that MMU Press mission will be an internationally recognized academic press. Its spirit is to connect Multimedia University (MMU) with the larger communities and institution through innovative and inspiring writings. We welcome all contributors to publish with MMU Press to better equip ourselves and the community at large with various new ideas and technologies.

Finally, all these achievements are made possible due to strong commitment by all especially the Coordinator of Special Publication – Dr. Tan Yi Fei, chief editors, editorial team members and the project leaders, who have contributed to the publication of RICES 2020. Kudos to all of you! Thank you and let's make MMU Press be the beacon of knowledge.

Assoc. Prof. Dr. Tan Siow Hooi
Deputy Director, Research Management Centre (Head, MMU Press)
Multimedia University

COMPUTING & INFORMATICS
Digital Creative & Cinematic Arts

A Prediction Framework of Energy Consumption Based on (IoT) Time Series Missing Value Datasets

Syed Nazir Hussain and Azlan Bin Abd.Aziz

INTRODUCTION

The new development of the Internet of Things (IoT) depends on reliable data delivery, where transferring data between devices should be accurate and fast to ensure high performance for IoT applications. IoT applications could suffer from low quality of data delivery due to several factors such as connection errors, sensor faults, or security attacks. Low quality of data delivery reduces the performance of IoT applications since if the collected data is missing it could eventually be useless. In this research, we introduced a new framework to predict the large gap(s) of missing values found in smart home electricity consumption time-series data.

METHODOLOGY

Figure 1 illustrates the sequential steps of the proposed framework.
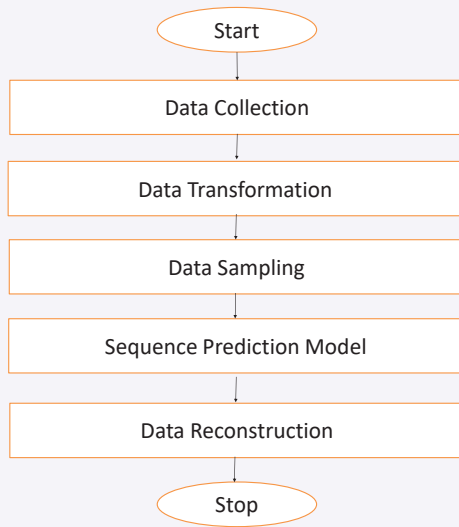
Figure 1: Flowchart of Proposed Framework

Factors Affecting Data Quality in Wireless Network Communication
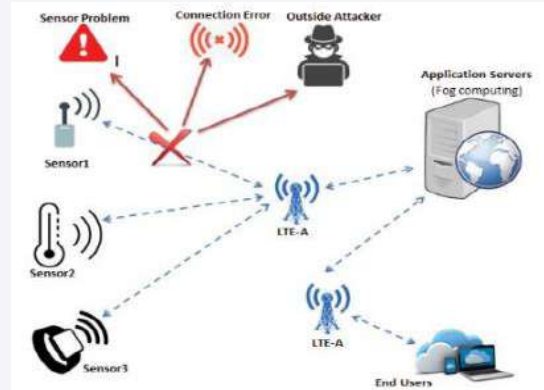
Figure 2: Reasons of missing data in (IoT) applications [1]
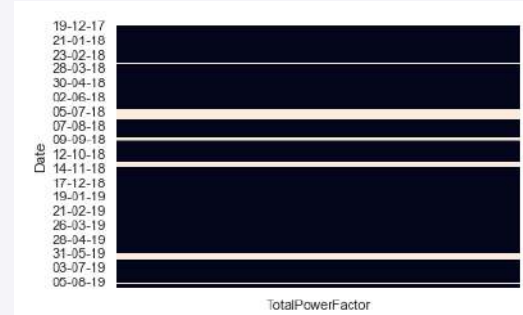
Figure 3: Electricity consumption time-series missing data

CONCLUSION

This research provides a solution to overcome the missing values generated from (IoT) sensors inside smart electronic appliances electricity load time-series datasets. The proposed framework is primarily built to predict consecutive large gaps of missing values using the forecasting technique shown in figure 3. A popular deep recurrent neural network such as LSTM has been used in this framework, ideal for predicting sequence data.

ACTORS	
STRENGTH (+	**WEAKNESS (-)**
The framework can predict missing values of any other time-series datasets like electricity consumption time-series data.	The proposed framework only supports univariate time-series data.
The framework make use of a popular deep recurrent neural network like LSTM to forecast non-linear electricity consumption patterns.	More data is required for the deep learning model to perform well.

REFERENCE

[1] N. Al-Milli, W. Almobaideen, Hybrid Neural Network to Impute Missing Data for IoT Applications, 2019 IEEE Jordan Int. Jt. Conf. Electr. Eng. Inf. Technol. JEEIT 2019 - Proc. (2019) 121–125.

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ABNORMAL BEHAVIOUR RECOGNITION VIA SIMPLE RECURRENT UNIT (SRU)

Nian Chi Tay, Connie Tee, Thian Song Ong

ABSTRACT

- ❖ There is a rising trend of security issues in society. However, the manual inspection of video footages captured from camera surveillance system (CCTV cameras) is prone to human error.
- ❖ SRU with attention mechanism model is proposed to automatically extract important features from the video frames and interpret the temporal information among the video sequences.
- ❖ Different from conventional neural networks, the proposed model includes attention mechanism that focuses on salient part of human action and has a shorter training time compared to conventional recurrent neural network such as Long Short-Term Memory (LSTM).

OBJECTIVES

- ❖ To study deep learning methods for abnormal behaviour detection
- ❖ To design a robust abnormal behaviour recognition framework for visual surveillance
- ❖ To develop algorithms to reliably recognize abnormal behaviour in visual data

METHODOLOGY

- ❖ The main idea of adapting SRU is to reduce the network training time while maintaining the accuracy of the model.
- ❖ The uniqueness of SRU are decomposed into two parts: (i) Light Recurrence and (ii) Highway Network.
- ❖ The two components allow more parallelism which improves computation speed in model training.
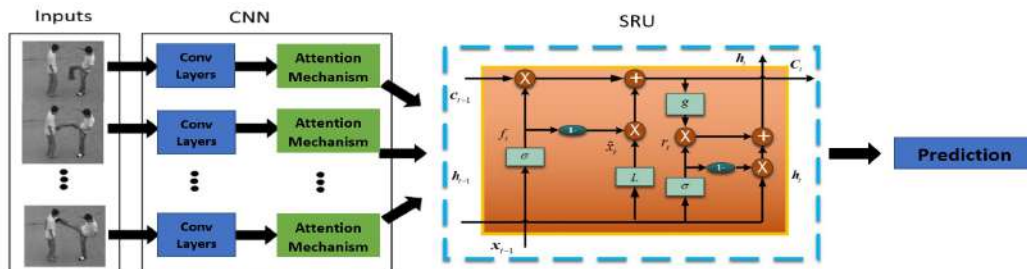
RESULTS

- ❖ Experiments are carried out using five benchmark datasets and the results were compared with LSTM method.
- ❖ SRU achieves average accuracy of 90% and the training time is significantly shortened by 1.5 times as compared to LSTM.
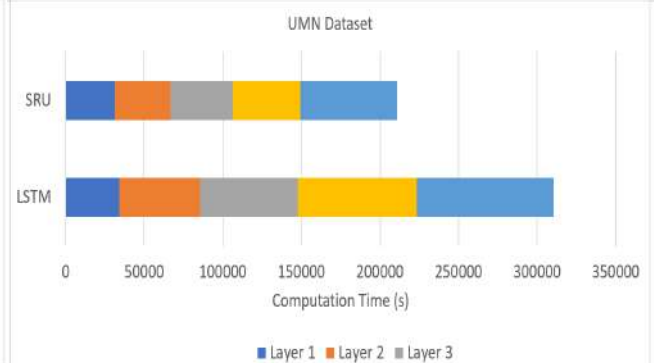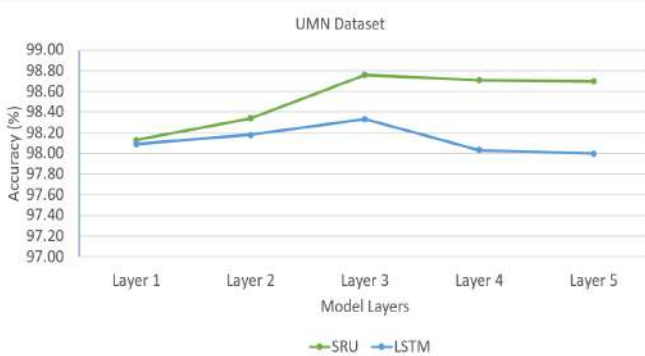
CONCLUSION

It is proven that SRU is suitable for abnormal behavior recognition with higher accuracy and shorter computational time as compared to LSTM.

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- ❖ Xu, K., Ba, J., Kiros, R., Cho, K., Courville, A., Salakhutdinov, R., Bengio, Y. (2016). Show, Attend and Tell: Neural Image Caption Generation with Visual Attention. ArXiv:1502.03044 [Cs]. Retrieved from http://arxiv.org/abs/1502.03044.
- ❖ Greff, K., Srivastava, R., Koutnik, J., Steunebrink, B., and Schmidhuber, J. (2017). Lstm: A search space odyssey. IEEE Transactions on Neural Networks and Learning Systems, 28.

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AN EXPERIMENTAL ANALYSIS OF VEHICULAR AD HOC NETWORK IN URBAN SCENARIO

Ts. Sumendra Yogarayan, Ts. Dr. Siti Fatimah Abdul Razak and Prof. Madya. Ts. Dr. Afizan Azman

Faculty of Information Science and Technology (FIST), Multimedia University (MMU)

Introduction

Vehicular Ad Hoc Networks (VANETs) are distributed between both stationary and moving vehicles, with infrastructure-independent wireless networks being created. Simulations are an important means of evaluating VANET protocols and architectures, as the physical experiment requires significant resources investment and are far beyond the scope of most researchers. This project attempts to address scalability of topology-based protocol of VANET in urban scenario.

Methodology

Our proposed work is to determine which vehicle nodes are able in forming a route that enable transmit and receive. Thus, multiple routing protocols such as OLSR, AODV, DSDV and DSR are configured to identify the suitable routing scalability.
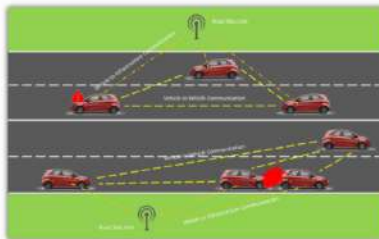
Evaluation and Results

In this work, OLSR, AODV, DSDV and DSR routing protocol performances were evaluated. Using network simulator 3 (NS3), the network simulated with 5, 25, 50 and 100 vehicle nodes were representing moving vehicles. The speed were 20m/s in an urban scenario and for 200s of simulated time.

Based on the results, there were two outcomes :-

1) The less the number of vehicles, the more appropriate and suitable the routing protocol may perform.

2) The possibility of some vehicles being chosen depends on the routing protocol that were configured.

Research Achievement

1. A Review of Routing Protocols for Vehicular Ad-Hoc Networks (VANETs). 2020 8th International Conference on Information and Communication Technology (ICoICT). [Published]

2. Topology Based Routing Protocol For Vehicular Ad Hoc Networks : A Mini Review. Indonesian Journal of Electrical Engineering and Informatics. [Under Review]

3. A Performance Measurement of OLSR, AODV, DSDV and DSR in Vehicular Ad Hoc Network. International Journal of Electrical and Computer Engineering (IJECE). [Under Review]

Applicability

VANET are considered as one of the most prominent technologies for improving the safety and efficiency of modern transportation systems.

There are two prominent applicability of VANET that are safety and convenience as follows :-

1) Safety applications that monitor the approaching vehicles, surfaces, surrounding and road curves.

2) Convenience applications that primarily tackle traffic management solutions.

Conclusion

VANET is a form of network that is established around the principle within a network of vehicles for a specific need or scenario. Due in part to their dynamic nature and conditional upon the configured routing protocol, the scalability of vehicle networks is crucial based on the project outcomes. A further exploration would therefore lead to the discovery of timely dissemination of messages between different vehicle nodes.

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Automated Detection of Speech Content for Film Censorship Using Deep Learning

Project Leader: Assoc. Prof. Ir. Dr. Hezerul Abdul Karim
Project Member: Mohd Haris Lye Abdullah, Assoc. Prof. Dr. Mohammad Faizal Ahmad Fauzi, Dr Sarina Mansor, Dr John See
Research Scholar: Nouar AlDahoul, Abdulaziz Saleh Ba Wazir, Hor Sui Lyn

Faculty of Engineering (FOE)

Problem Statement

- All local and foreign films should obtain **suitability approval** before distribution or public viewing (Ministry of Home Affairs – Security Collective Responsibility).
- The process of screening speech contents for censorship purpose involves recruiting a **large number of manpower 24/7**, and thus imposes a huge censorship cost per month.
- All the recruited personnel should participate into **an extensive training** to ensure the fulfilment of filtering standards which leads to increment in censorship cost.
- **Manual** speech content detection is **inaccurate** due to **fatigues of manpower** and **weakness of human visual system in long-term screening**.
- Identifying inappropriate visual and speech contents suffers from **low-speed** detection specially in long movies because of speed limits of human visual system.

Solution Description

This Solution uses deep learning algorithms of Recurrent Neural Network (RNN) to detect unwanted speech contents by detecting the transcription of unwanted spoken terms. Moreover, our solution utilizes Convolutional Neural Network (CNN) to detect speeches fall within foul language category. The system specifically detects the location of inappropriate frames within a video or audio files and processes them.
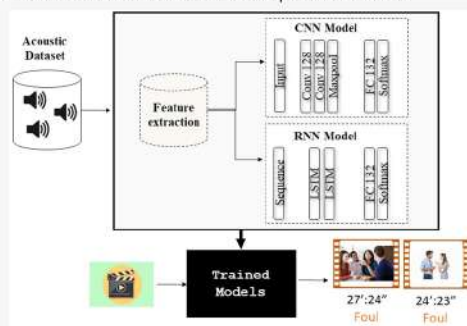
Featured Results

Accuracy	96.11%
Precision	93.68%
Recall	98.89%
F-score	96.22%
Detection Time	54.3 ms
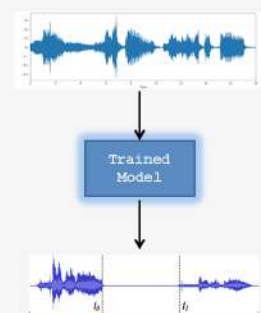
Commercialisation Potential

- Robust automatic censorship for broadcasting companies and video providers in video and audio screening such as UNIFI and ASTRO compared to the manual one.
- Automated film censorship system can benefit content providers such as YouTube, Facebook, Instagram, and Tik Tok because less manpower needed to monitor contents uploaded by large number of users.
- Our proposed system can help the recruited personnel to detect such inappropriate contents accurately in a short time.

Special highlights

- Collaboration between MMU and TM and the research is fully funded by TM R&D, Malaysia
- Fast and accurate detection (Detection speed of 54.3 ms)
- System flexibility to be trained with other categories of unwanted contents (e.g. another language)
- Presentation: 3 conference presentations
- Publication: 2 conferences, 1 journals
- Copyright: 1
- Gold Medal at RICES 2019
- Silver Medal at MTE 2020

List of Publications

1. Rasoul Banaeeyan, Hezerul Abdul Karim, Mohd Haris Lye Abdullah, Mohammad Faizal Ahmad Fauzi, Sarina Mansor, John See Su Yang, "Acoustic Pornography Recognition Using Fused Pitch and Mel-Frequency Cepstrum Coefficients", International Journal of Technology 10(7):1335, November 2019.
2. Abdulaziz Saleh Ba Wazir, Hezerul Abdul Karim, Mohd Haris Lye Abdullah, Sarina Mansor, "Acoustic Pornography Recognition Using Recurrent Neural Network", IEEE International Conference on Signal and Image Processing Applications (IEEE ICSIPA), September 17-19, 2019, Malaysia, Kuala Lumpur.
3. A. S. B. Wazir, H. A. Karim, M.H. Lye, S. Mansor, N. AlDahoul, M. F. A. Fauzi, J. See, "Spectrogram-Based Classification of Spoken Foul Language Using Deep CNN", IEEE International Workshop on Multimedia Signal Processing (MMSP2020), Virtually in Tampere, Finland, September 21–24, 2020.

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Automated Detection of Visual Contents for Film Censorship Using Deep Learning

Project Leader: Assoc. Prof. Ir. Dr. Hezerul Abdul Karim
Project Member: Mohd Haris Lye Abdullah, Assoc. Prof. Dr. Mohammad Faizal Ahmad Fauzi, Dr Sarina Mansor, Dr John See
Research Scholar: Nouar AlDahoul, Abdulaziz Saleh Ba Wazir, Hor Sui Lyn

Faculty of Engineering (FOE)

Problem Statement

- All local and foreign films should obtain **suitability approval** before being broadcast to public (Ministry of Home Affairs — Security Collective Responsibility).
- Traditional **manual solution** of visual content screening requires recruiting a **large number of manpower 24/7** for censorship purpose.
- **Manual solution** depends on **training the employees extensively** to ensure the fulfilment of filtering standards.
- **Manual censorship** is **costly** and includes monthly salaries of employees, training cost, and sometimes extra money as fine.
- **Accuracy of manual** visual content detection is affected by **psychological emotions of manpower** and **weakness of human visual system in long-term screening**.
- The **speed** of **existing manual solution** is related to human visual system and personal abilities to process visual observations. It also **degrades** in long movies.

Solution Description

The proposed solution uses deep learning models such as EfficientDet to detect ROIs that contain nudity or pornography inside video frames. The system is able to detect the temporal locations of inappropriate visual contents in specific timestamps inside videos and at the same time it can detect spatial locations of nude or porn regions inside one frame. The proposed system targets both categories of natural photo and cartoon pornography.
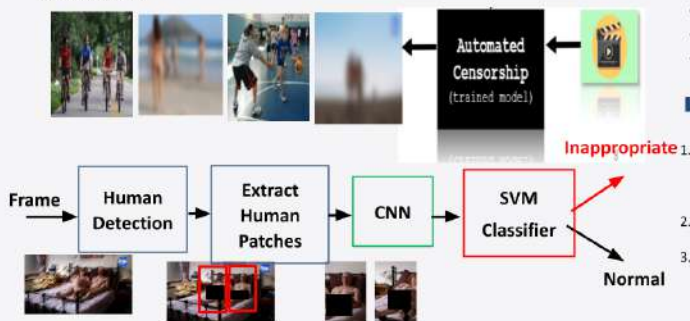
Featured Results

Model	Accuracy %	Recall %	Precision %	FNR %	FPR %	Speed
ResNet50	94.44 %	94.0 %	93.753 %	6 %	5.2 %	-
ResNet101	93.777 %	92.5 %	93.598 %	7.5 %	5.2 %	-
EfficientNetB4	93.2216 %	91.5 %	93.272 %	8.5 %	5.4 %	32 fps
EfficientNetB0	93.4438 %	92 %	93.186 %	8 %	5.4 %	64 fps
EfficientNetB7	94.444 %	92.5 %	94.916 %	7.5 %	4 %	12 fps

Commercialisation Potential

- Robust, fast, and accurate automatic censorship system for TV broadcasting companies such as UNIFI and ASTRO.
- Automated film censorship system also targets video providers such as YouTube, Netflix, Facebook, Instagram, and TikTok because it saves time and cost to monitor contents uploaded by large number of users.
- Our proposed system can help the recruited personnel to detect inappropriate visual contents accurately in a short time.

Special Highlights

- Collaboration between MMU and TM and the research is fully funded by TM R&D, Malaysia
- Fast and accurate detection (Detection speed is 20 FPS)
- The detection system is able to be extended to cover other inappropriate categories of visual contents.
- Presentation: 2 conference presentations
- Publication: 2 conferences, 1 journal
- Copyright: 1
- Gold Medal at RICES 2019
- Silver Medal at MTE 2020

List of Publications

1. Nouar AlDahoul, Hezerul Abdul Karim, Mohamad Faizal Ahmad Fauzi, Mohd Haris Lye Abdullah, Sarina Mansor, John See, "Local Receptive Field-Extreme Learning Machine based Adult Content Detection", IEEE International Conference on Signal and Image Processing Applications (IEEE ICSIPA), September 17-19, 2019, Malaysia, Kuala Lumpur.
2. Nouar AlDahoul, Hezerul Abdul Karim, Transfer Detection of YOLO to Focus CNN's Attention on Nude Regions for Adult Content Detection, Neurocomputing (Submitted, 2020)
3. A. S. B. Wazir, H. A. Karim, M.H. Lye, S. Mansor, N. AlDahoul, M. F. A. Fauzi, J. See, "Spectrogram-Based Classification of Spoken Foul Language Using Deep CNN", IEEE International Workshop on Multimedia Signal Processing (MMSP2020), Virtually in Tampere, Finland, September 21–24, 2020.

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AUTOMATED DIAGNOSIS OF CHRONIC WOUNDS FOR E-HEALTH APPLICATIONS

Mohammad Faizal Ahmad Fauzi[1], Topu Biswas[1], Khajista Nizam[1], Nurul Nadia Ahmad[1],
Fazly Salleh Abas[2], Logeswaran Rajasvaran[3], Harikrishna K R Nair[4]

[1]Faculty of Engineering, Multimedia University, Cyberjaya, [2]Faculty of Engineering and Technology, Multimedia University, Melaka,
[3]Asia Pacific University, [4]Hospital Kuala Lumpur

Introduction:

7 million patients in Malaysia by 2025   **422** million diabetic patients worldwide   **2.5** billion healthcare cost
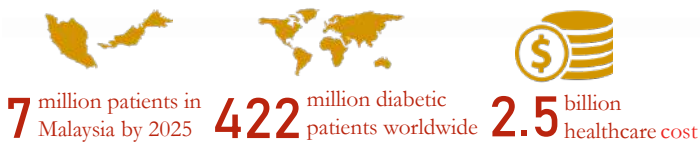
- With the soar of diabetic and obesity patients worldwide, chronic wounds are becoming a significant threat.
- Current manual methods are mainly based on visual examination, poses several drawbacks including low accuracy, time-intensive and also subject to intra- and inter-reader variability.

Methodology:
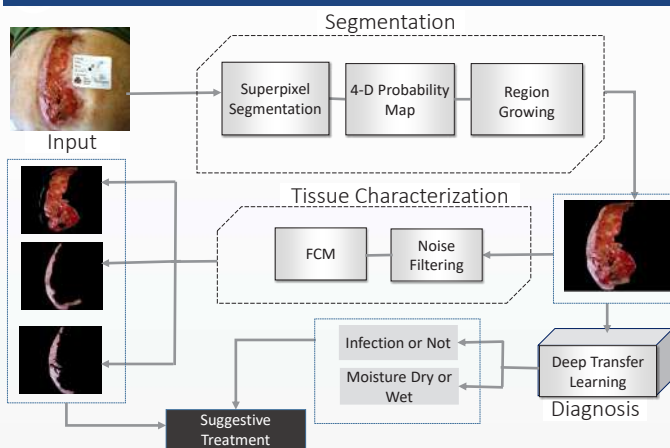
Interface:
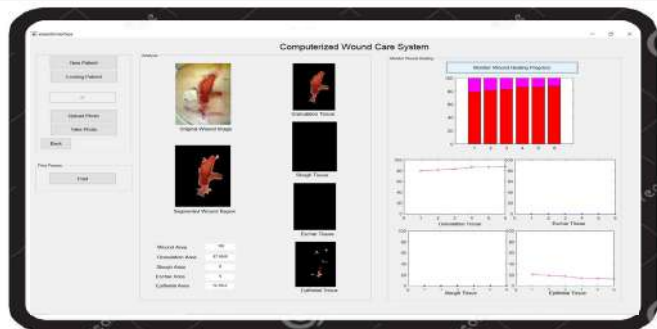
Results:

Segmentation:

✓ In proposed computerized approach, an overall 80% accuracy achieved and it takes less than 3 seconds to process a 1024*768 image.

✗ In manual method inter-reader agreement between different clinicians varies between 67.4% and 84.3%.

Tissue Characterization:

✓ Overall 95% accuracy achieved for different tissues classification, needs a few seconds to analyze segmented wound.

✗ The manual process is very time-consuming and highly prone to human bias.

Diagnosis:

✓ The accuracy for moisture detection is 80% and for infection detection is 75%, requires less than a minute to provide suggestive treatment.

✗ Wounds look superficially similar although the underlying aetiology and pathology are numerous, leads clinician to high rate of misdiagnosis.

Key Features:

- Fast and high accuracy - reduces clinical workload significantly and error fee wound assessment.
- Non-invasive - eliminates patients discomfort, pain, infections, etc.
- E-Health framework allows patients to connect with expert clinicians, reduces the economic burden and physical travel.
- It provides tractable medical information.

Special Highlights:

- This is the first work in attempting to create a comprehensive wound care and diagnosis system.
- Awarded 7 different awards including 'Best of Best Award' overall within 247 projects in NIICe2019.
- A total of 8 journal and conference articles published/accepted to date.
- Funded by ScienceFund under the Ministry of Science, Technology and Innovation (MOSTI)
- High commercialization potential – Can be used by all hospitals, medical centers and clinics nationwide.

In Collaboration With:

Automatic Blending of Two 3D Model Parts

[1]Yih-Jian Yoong, [2]Kok-Why Ng, [3]Seng-Beng Ng, [4]Mohamed Hatem Hassan

[1,2,4]Faculty of Computing and Informatics, Multimedia University.
[3]Faculty of Computer Science and Information Technology, University Putra Malaysia.

Abstract

Three-dimensional shapes blending method can produce various in-between shapes from two or more inputs of model shape. Though, many of the blended shapes may be implausible due to improper parts-segmentation, inappropriate matching-parts, different inputs of model type, non-tally number of segmentation parts and etc., which need to take into account in the beginning of a research work. This paper proposed to segment the models using Snake-based segmentation method. This method outperforms many existing segmentation methods. The segmented parts are then blended automatically based on user preferred blended parts. The blended result is logical, realistic and well-accepted. This method is potential to be applied in many industries to generate new design shapes to outstand their products.

Introduction

Three-dimensional (3D) modeling is getting more and more important nowadays especially in the games and movies industries to meet the audiences' visual excitement. Various modeling methods have been proposed such as Image-based modeling, Digital Sculpting, Volumetric modeling and etc. These techniques produce high quality model, but they require huge amount of modelling time and manpower to create a model.

3D blending method morphs two or more inputs of model shapes to form a new model. The new model is the intermediate shape of all the input models. This technique is fast in modeling and the output is always excited with various new shape designs. This best suits the entertainment industries to give brand new ideas to the audiences.

Achievements

- One copyright filed – No. LY2019008509
- Funded by e-Science fund 2013-2015 (RM160k)
- Funded by MMU Mini Fund 2019-2020 (RM20k)
- Won Silver medal in Pecipta2019
- Won Gold medal in CashVic2020
- Won Best Poster in CashVic2020

Best Poster Award

Gold medal

Silver medal

Proposed Algorithm

1. Input of two 3D models and generate skeleton features
2. Initiate surface point and relocation
3. Computation of minimum cost and relocation
4. Computation of prevention cost
5. Computation for snake along each feature till the end
6. Restoration to original coordinate
7. Features corresponding
8. In-between local points interpolation

Results and Discussion

Segmentation step:
Model is voxelized to remove the outliers. It is then reduced to a 1D skeleton. Snake-based algorithm is applied to locate the boundary of each feature. Color-filled algorithm is applied to obtain a segmented model.

Segmented Dog model

Segmented Horse model

Entire process from 3D input model to a complete segmented semantic features.

Accuracy metrics for Dog model

Accuracy metrics for Horse model

Source part + Target part = Blended part
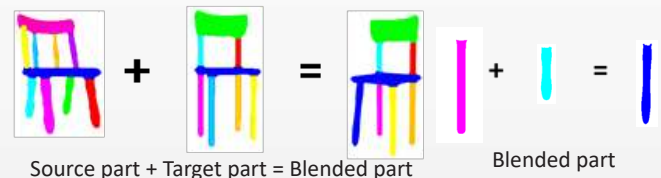
Blended part

Conclusion

This project has successfully segmented models into semantic features and automatically blend the segmented parts to produce a brand new model shape. The entire process takes no more than a few seconds. In future, we will apply our method on more complicated models.

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MMU
MULTIMEDIA UNIVERSITY

AUTOMATIC DIRTY DATA CLEANING APPROACH FOR DATA ANALYTICS USING MACHINE LEARNING TECHNIQUES

1)Faculty of Engineering and Technology, 2)Faculty of Information Science And Technology
Ts. Dr. Md. Jakir Hossen[1], Jesmeen Mohd Zebaral Hoque[1], Chy. Mohammed Tawsif Khan[1], Ts. Dr. Md. Shohel Sayeed[2], Dr. Azlan Bin Abd Aziz[1]

Introduction: Data Analytics (DA) is used to predict effective outcomes. However, inappropriate data may lead to poor analysis and unacceptable conclusions. Hence, transforming the inappropriate data from the entire dataset into useful data is essential. A new architecture Automatic Missing Value Imputation (AMVI), was developed to predict missing values in dataset using Machine Learning (ML). It able to select the suitable features for the suitable ML models automatically, depending on the form of the data set obtained from various domain. These abilities of data cleaning process can enhance the performance of DA, by replacing the current manual data cleaning with an intelligent one.

Key features
- Predictive model
- Enhances data analytics
- Supportive for different domain (non-sequence data)

Methodology
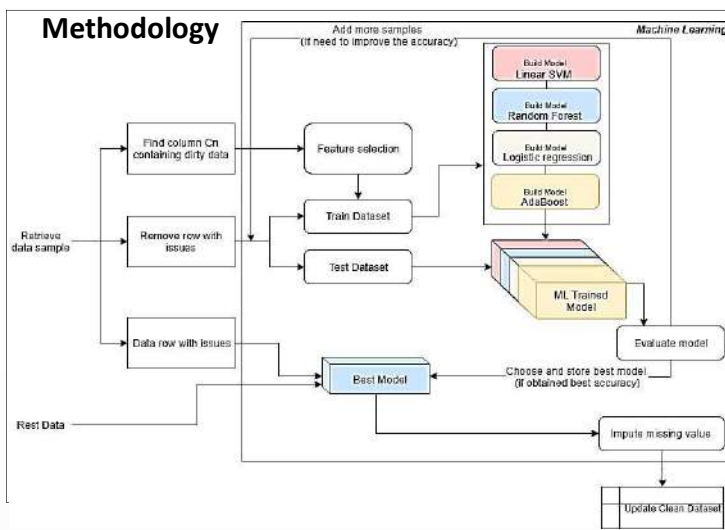
Accuracy Percentage vs Data Volume for Trained ML

# of Instance	Model Accuracy	Cross-Validation Score
20000	88.10%	86.082%
40000	92.65%	88.233%
60000	90.05%	87.285%
80000	90.84%	87.043%

Paper	Performance (Precision:P)	Compared with AMVI
An improved support vector machine-based diabetic readmission prediction [1]	Accuracy using SVM model 82.70%	The developed system final DA prediction gives around 91% accuracy for Random Forest, CART and Logistic Regression
Predicting Diabetic Readmission Rates : Moving Beyond HbA1c [2]	Over all AUC: 0.56 [0-30): P 0.3651, Acc 84.81% [30-70): P 0.2288, Acc 78.5% [30-70): P 0.1857, Acc 68.5%	The developed system for over all data set is 0.64 using tree classifier (Random Forest)
[3]	Accuracy: 63.38%	Used SVM technique. Ignore cleaning

Intellectual Property (IP)
The copyright act 1987, Malaysia: LY2019008548
Title: Automatically Cleaning Dirty Data in Data Analytical Process using Machine Learning Paradigm

Awards received
Best Paper Award in "3rd International Conference of Electrical, Electronics, Communication and Control Engineering, ICEECE"

Related Research Papers
1. Automatic Missing Value Imputation for Cleaning Phase of Diabetics Readmission Prediction Model, International Journal of Electrical and Computer Engineering (under review)
2. AUTO-CDD: automatic cleaning dirty data using machine learning techniques, Telkomnika (2019), 17(4)
3. A survey on cleaning dirty data using machine learning paradigm for big data analytics. Indonesian Journal of Electrical Engineering and Computer Science (2018), vol .10
4. Modifying Cleaning Method in Big Data Analytics Process using Random Forest Classifier, 7th International Conference on Computer and Communication Engineering 2018

References:
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Bioinformatics Database: COVID-19 Vaccine Candidates by Identification of B and T Cell Multi-Epitopes Against SARS-CoV-2

msu management & science university

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Team members: Sarmilah Mathavan, Wee Jia Jin, Nur Azznira Bt Azman, Devindren Subramanaiam, Nur Afiqah Binti Zainalabidin, Dhivashini Lingadaran, Zainah Binti Abdul Sattar, Danniya Lakshmi Manickam, Priscilla Sheba Anbananthan, Johan Ahmad Taqiyuddin, Yuvapriya Thevarajan

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ABSTRACT

Coronavirus disease (COVID-19) is caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). Until now there is no antiviral drug and vaccine for COVID-19. In this study, we used consensus sequence for SARS-CoV-2 proteome that was retrieved from NCBI database. The various bioinformatics tools were used to predict multi-epitopes of B-cell and T-cell in SARS-CoV-2. The best epitopes of B and T-cell epitopes were predicted with high antigenicity and the information is disseminated through web-based database resource (https://covid19.omicstutorials.com/epitopes/). This study will be useful to find a new vaccine candidate for SARS-CoV-2.

INTRODUCTION

The SARS-CoV-2 proteome consists of the spike (S), envelope (E), nucleocapsid (N), membrane (M), orf3a, or6, orf7a, orf8 and orf10 (Srinivasan et al. n.d.). Effective vaccination is important to contain the pandemic outbreak of SARS-CoV-2. Vaccine trials are ongoing but vaccine development can take several months to years. Lots of ongoing research concentrate on SARS-CoV-2 virus spike protein (Abraham Peele et al. 2020). The existence of pre-existing memory T cells in humans with the capacity for recognizing SARS-CoV-2 is little understood (Chen and John Wherry 2020). Such knowledge is of urgent significance and will aid in the design of vaccines and facilitate the evaluation of immunogenicity of vaccine candidates. Much of the epitope research focussed on the virus' spike protein and had insufficient knowledge about MHC-I and MHC-II alleles.

METHODOLOGY
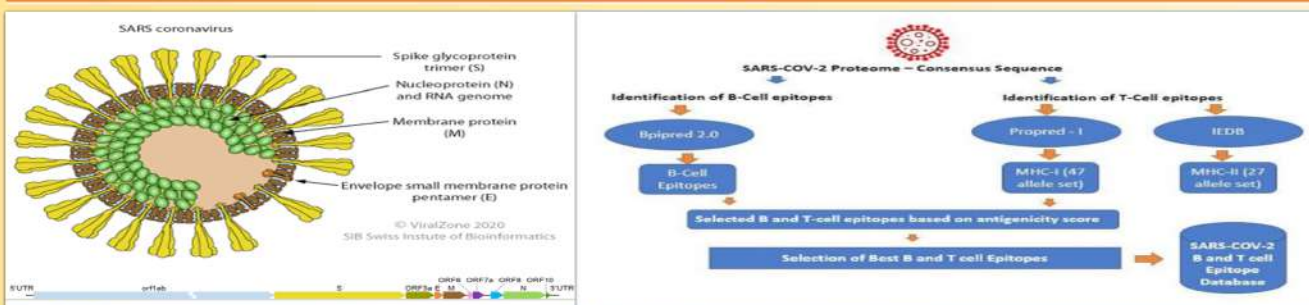
Figure 1: Reverse vaccinology approaches used to identify potential B and T-cell epitopes from the proteome of SARS-CoV-2

RESULTS

Table 1: Predicted potential B-cell , MHC-I and MHC-II T-cell epitopes of SARS-COV-2

	B- Cell	MHC-I	MHC-II
Spike Glycoprotein (S)	12	92	560
NucleoProtein (N)	5	6	203
Membrane Protein (M)	1	36	106
Envelope protein (E)	1	6	35
Orf1ab	81	68	129
Orf3a	2	5	101
Orf6	1	16	18
Orf7a	1	15	52
Orf8	1	44	55
Orf10	1	17	135

Figure 2: The homepage of SARS-COV-2 predicted epitope database available at: https://covid-19.omicstutorials.com/

DISCUSSION

❑ We used all structural, non-structural and accessory proteins of SARS-CoV-2 for B and T-cell epitope prediction using various immunoinformatics tools (Fig 1).

❑ For B-cell prediction was made by using Bepipred Linear Epitope Prediction 2.0. For T-Cell prediction (MHC-I & MHC-II) epitopes were predicted with ProPred I server by using HLA class I epitopes that bind to 47 alleles of HLA I. For HLA class II epitopes were predicted using IEDB with allele selection of 27 full HLA reference set. The predicted epitopes are show in Table 1.

❑ These predicted multi-epitopes will be crucial for vaccine design against COVID-19 were disseminated through database (Fig 2) available at: https://covid-19.omicstutorials.com/epitopes/ .

KEY POINTS

❑ We used all sequences of different geographical location sequence considering all mutated sequence through sequence variation analysis including spike protein (D614G).

❑ Most of the COVID-19 vaccine under clinical trial and for production are depend on B-Cell epitopes and their neutralizing antibody (NAb) responses were relatively short lived (1–2 years) and prone to antigen escape, raising the possibility of re-infection.

❑ Our multi-epitope prediction of T-Cell will pave way to provide broader protection which the virus can less easily circumvent through mutation and their (NAb) will be long-lived (>6–17 years).

REFERENCES

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❑ Peele, K. Abraham, et al. "Design of multi-epitope vaccine candidate against SARS-CoV-2: a in-silico study." Journal of Biomolecular Structure & Dynamics (2020): 1.

❑ Chen, Zeyu, and E. John Wherry. "T cell responses in patients with COVID-19." Nature Reviews Immunology (2020): 1-8.

Connected and Interactive Advertising Campaign (CONNECT-INTERACT)

Dr. Ong Lee Yeng, Dr. Leow Meng Chew, Prof. Koo Voon Chet, Prof. Lau Siong Hoe, Mr. Loo Eng Keong, Mr. Leow Kang Ren, Mr. Lai Guo Yao

This project aims to showcase a **centralized digital-out-of-home (DOOH) advertising system** that provides a closer interactive platform between advertisers and prospective customers.

OLD-FASHIONED WAY

BROCHURE — 10% OFF — VS — NEW WAY — Voucher

HOW TO

1. SCAN QR CODE TO JOIN
2. SOCIAL LOGIN
3. INTERACTION ACTIVITIES
4. INCENTIVE REWARDS

WHY

- Word-Of-Mouth Market Infiltration
- Effective Customer Targeting
- Engaging Customer Experience
- Better Customer Understanding

ITEX 19 GOLD · iCAN 2019 Toronto, Canada · Pecipta'19 Gold · SIIF Seoul International Invention Fair Special Award

PATENT & COPYRIGHT FILED · A COLLABORATIVE PROJECT WITH TM INFO-MEDIA SDN. BHD.

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EARLY DETECTION AND PREDICTION OF FOREST FIRE FROM THE MACHINE LEARNING PERSPECTIVE

Yee Jian Chew, Lee Nicholas, Shih Yin Ooi, Ying Han Pang, Sook Ling Lew

INTRODUCTION

Forest fire (wildfire) is one of the devastating disasters that will contribute harmful impacts to the victims and environment [1]. For instance, severe forest fire can engulf an immense area of land, and wipe out a number of precious life. Furthermore, smokes emitted will subsequently deteriorate the air quality.

METHODOLOGY

Forest fire can be triggered by multiple factors including climate changes, wind speed, temperature, and human factors.

By feeding these data to a machine classifier, it will be able to utilise them to analyse and forecast an early detection of forest fire. In this research, **11 machine learning algorithms** is utilised.

EXPERIMENT

Wild Fire Prediction Dataset [2] is employed in the experimental procedures.

In this dataset, a total of 1713 instances with 3 affecting attributes are used to predict forest fire. The attributes include **NDVI** (crop's health), **LST** (soil's temperature), and **Thermal Anomalies** (fire indicator).

SCENARIO

AFFECTING ATTRIBUTES

MACHINE LEARNING ALGORITHM

PREDICTION

FIRE **NO FIRE**
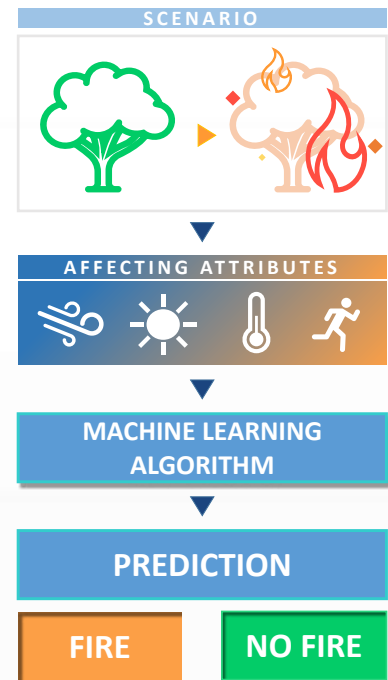
"Random Forest achieves the best results, 84.18 % of accuracy"

Classification Accuracy of 11 Machine Learning Algorithm on Wildfire Prediction Dataset

Legend: J48 Decision Tree, Random Forest, Elman Network, Decision Stump, Logistic Model Trees, Random Tree, Reptree, Hidden Markov Model, Hoeffding Tree, Support Vector Machine, Naïve Bayes

Values: 79.57, 84.18, 77.64, 77.47, 79.45, 80.21, 79.57, 77.47, 77.52, 77.47, 77.82

Y-axis: Classification Accuracy (%)

CONCLUSION

Experimental results showed that it is possible to adopt machine learning as an integrated approach for early detection of forest fire.

Among the 11 classifiers, Random Forest achieves the best results with 84.18% accuracy. In future, similar experimental procedure can be employed in **Malaysia** to detect forest fire.

REFERENCES

1. Worst Wildfires in US History: Earth.Org - Past: Present: Future. (2020, September 15). Retrieved November 06, 2020, from https://earth.org/worst-wildfires-in-us-history/
2. O. S. Younes, M. Hajar, and A. M. Hassan (2019), "Data for: Predictive Modeling of Forest Fires: A New Dataset and Machine Learning Approach", Mendeley Data, http://dx.doi.org/10.17632/85t28npyv7.1.

EXPLORING THE EFFECTS OF LOW-LIGHT IMAGE ENHANCEMENT ON NETWORK-BASED OBJECT DETECTION

Yuen Peng Loh (Mini Fund Research 2019/2020 Grant MMUI/190020)

Faculty of Computing and Informatics

1 Enhancement algorithms have shown potential to help network-based models perform practical tasks

Low-light Image → Enhancement Algorithm → Enhanced Image → Object Detector →

Results

Object class: **Bicycle**
Bounding Box Coordinates:
(287,101,211,246)

Fast-RCNN Object Detector

VGG-16 Backend

Input Image

Convoluted maps
Pooled maps
Fully connected neurons

ROI Pooling → Object Classification / Bounding Box Regression

2 But typical performance metrics only shows *how well* an algorithm helped a detector

3 Do not show *what* have been enhanced that could be *seen* by the detector

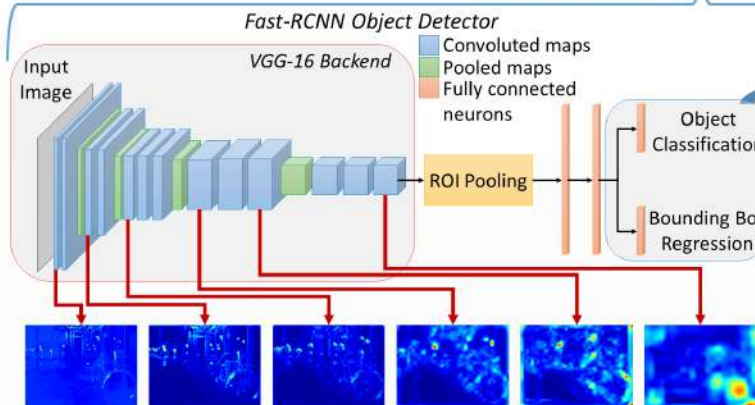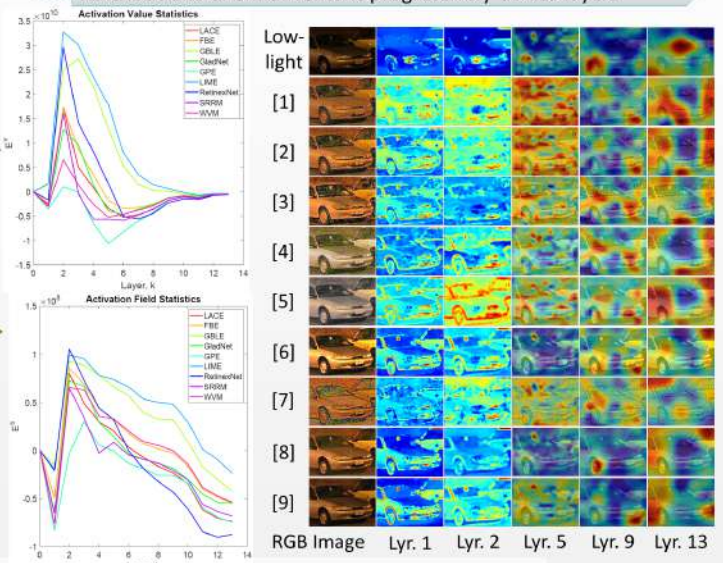| Methods	*F*-score	AP
LACE [1]	±0.00%	+12.50%
FBE [2]	−5.47%	+9.38%
GBLE [3]	−16.41%	−7.82%
GladNet [4]	−1.56%	+18.75%
GPE [5]	±0.00%	**+20.31%**
LIME [6]	−11.72%	+4.69%
RetinexNet [7]	−15.63%	+1.56%
SRRM [8]	+7.03%	+12.50%
WVM [9]	−3.13%	+7.82%

+: improvement
−: degradation

4 Feature map activations of convolutional neural network layers are the keys to understanding the model's attention

5 Approach: Look into the changes of activation values after enhancement for each layer focusing on the object of interest
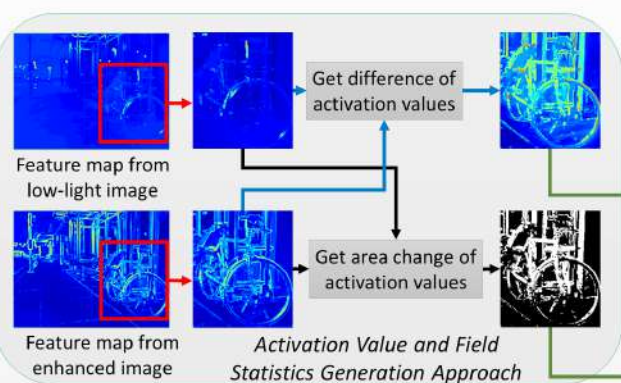
6 Statistics generated allow visual inspection into the average contributions of enhancement progressively across layers

Get difference of activation values

Get area change of activation values

Feature map from low-light image

Feature map from enhanced image

Activation Value and Field Statistics Generation Approach

Activation Value Statistics

Activation Field Statistics

Low-light
[1]
[2]
[3]
[4]
[5]
[6]
[7]
[8]
[9]

RGB Image   Lyr. 1   Lyr. 2   Lyr. 5   Lyr. 9   Lyr. 13

7 Findings:
- Possible *negative correlation* between the **performance** of an object detection model with respect to the **visual quality improvement** by low-light enhancement algorithms
- Low-light enhancement algorithms with **structure emphasis** produces output with **features that can be propagated into deeper layers** of the object detector
- Approach is extendable to study other enhancements and tasks

References:
[1] Li, L., Wang, R., Wang, W., Gao, W. (2015). A low-light image enhancement method for both denoising and contrast enlarging. In *2015 IEEE ICIP* (pp. 3730-3734). IEEE.
[2] Fu, X., Zeng, D., Huang, Y., Liao, Y., Ding, X., & Paisley, J. (2016). A fusion-based enhancing method for weakly illuminated images. *Signal Processing*, 129, 82-96.
[3] Tanaka, M., Shibata, T., & Okutomi, M. (2019). Gradient-based low-light image enhancement. In *2019 IEEE ICCE* (pp. 1-2). IEEE.
[4] Wang, W., Wei, C., Yang, W., & Liu, J. (2018). GLADNet: Low-light enhancement network with global awareness. In *2018 IEEE FG* (pp. 751-755). IEEE.
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GAIT RECOGNITION USING DEEP CONVOLUTIONAL FEATURE AND HASH CODING

Pa Pa Min, Md Shohel Sayeed, Thian Song Ong
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INTRODUCTION

Gait recognition is the behavioral biometric trait that tracks human based on their walking motion. This paper addresses the gait retrieval problem which is used to retrieve similar gait person from large-scale dataset given by the query subject using deep gait retrieval hashing model (DGRH). The model uses a supervised hashing method with a deep convolutional network and compact hash codes learning. The learning loss is designed with the classification loss function to learn the similarity-preserving, and the quantization loss function to control the quality of hash codes.

METHODOLOGY

Convolutional Layers+Pooling Layers — Classification Loss — Quantization Loss — Fully Connected Layer — Hash Layer — Input
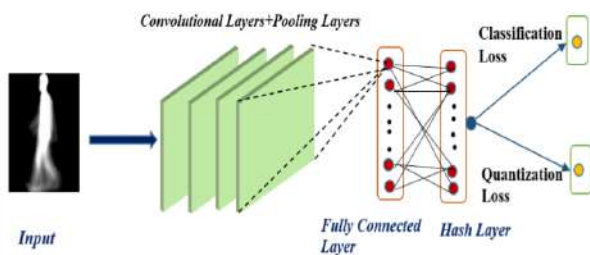
- Spatio-temporal gait representation called Gait Energy Image (GEI) is used as the input gait.[2]
- DGRH model is a supervised hashing model which combines the gait feature extraction and binary hash codes learning.
- The sub-network of convolutional layers and pooling layers extract the gait features
- The binary hash codes are generated from the last fully connected layer
- The classification and quantization loss optimize the network and learned hash function

Classification Loss

$$L_C = -\frac{1}{N}\sum_{i=1}^{N}\sum_{j=1}^{C} Y_{ij} \log \frac{e^{w_j^T h_i}}{\sum_{k=1}^{C} e^{w_k^T h_i}} + \frac{\lambda}{2m}\left(\sum_{i=1}^{L}\|W_h\|_F^2\right)$$

Quantization Loss

$$L_Q = \sum_{i=1}^{N} \log \cosh(|h_i| - 1)$$

RESULTS AND DISCUSSION

Dataset	Mean Average Precision (MAP)			
	16 bits	32bits	48bits	64bits
CASIA-B	0.69	0.68	0.81	0.87
OUISIR	0.81	0.84	0.97	0.98
OUMVLP	0.47	0.53	0.56	0.65
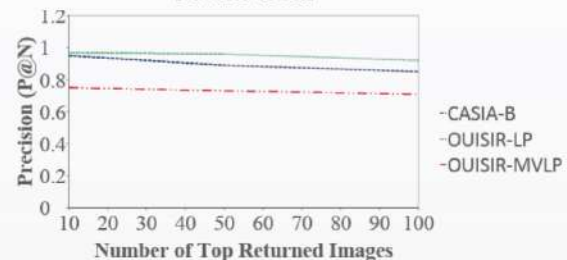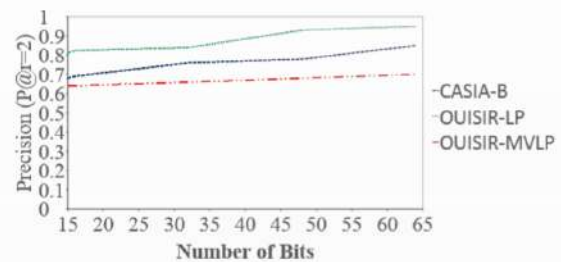
- The end-end-end hashing model was able to learn the discriminative gait features and efficient in terms of storage memory and speed.
- The proposed method was evaluated on the three different public datasets and able to achieve desired outcomes.

PUBLICATION

[1] Pa Pa Min, S. Sayeed, T.S. Ong (2019). Gait Recognition Using Deep Convolutional Features. 7th International Conference on Information and Communication Technology (ICoICT), 2019.

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Assoc. Prof. Dr. Ting Choo Yee, Dr. Ho Chuing Ching,
Nicholas Tan Yu Zhe, Lim Wei Lun

Overview

GeoEMI aims to develop and deploy **emotional intelligence** into **LOCATIC** engine and subsequently integrate it into the newly re-engineered TM SmartMap. This work will utilize existing TM UNIFI customer Trouble Ticket as primary source of data.

Research

Geotagging with Sentiment Analysis using Deep Learning and Bayesian Networks
- Deep Learning to predict sentiment.
- Dynamic Bayesian Networks for look-ahead churn prediction.

Demo Snapshot

GeoEMI

| 5597 / 8106 Churn / Complaint | 2015-06-09 / 2019-09-26 Earliest / Latest Complaint |
| 4/3 Average Complaint / Average Churn | 2016-9-21 Estimated date to churn |

Map

Taman: SRI JATI I, OLD KLANG ROAD, KUALA LUMPUR
First complaint date: 2015-06-19

Proposed Solution

UNIFI, Social Media data

GeoEMI Emotion Intelligence Engine

GeoEMI Sentiment database

Location Profiler and Analytics

LOCATIC database

TM SmartMap Engine

TM SmartMap database

TM SmartMap User Interface

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IN-VEHICLE ACTIVE MONITORING TOOL (iV-Active)

Ts. Sumendra Yogarayan, Ts. Dr. Siti Fatimah Abdul Razak & Prof. Madya. Ts. Dr. Afizan Azman, Ts. Mohd. Fikri Azli Abdullah & Ts. Siti Zainab Ibrahim

Faculty of Information Science and Technology (FIST), Multimedia University (MMU)

Introduction

Recent findings have shown that road accidents eventually leads to driver's health abnormalities and lack of vision from alcohol. Internet of Thing (IoT) has a significant growth in this evolving landscape to innovate new ideas to make things smart. That has led in providing better safety and improved accessibility for vehicle owners, new revenue opportunities for vendors and more value-added reliability for insurance providers.

CASE 1 – 2017
A GrabCar driver has fatal heart attack while dropping off passenger at KLIA2.

CASE 2 – 2018
A man suffers heart attack before crashing into another car.
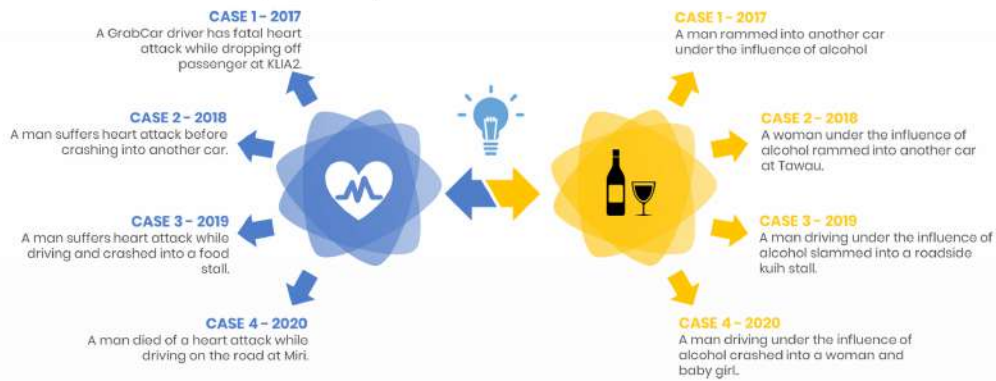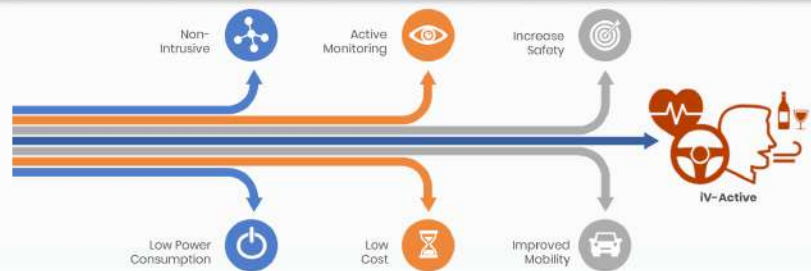
CASE 3 – 2019
A man suffers heart attack while driving and crashed into a food stall.

CASE 4 – 2020
A man died of a heart attack while driving on the road at Miri.

CASE 1 – 2017
A man rammed into another car under the influence of alcohol

CASE 2 – 2018
A woman under the influence of alcohol rammed into another car at Tawau.

CASE 3 – 2019
A man driving under the influence of alcohol slammed into a roadside kuih stall.

CASE 4 – 2020
A man driving under the influence of alcohol crashed into a woman and baby girl.

Methodology

Non-Intrusive — Active Monitoring — Increase Safety

Low Power Consumption — Low Cost — Improved Mobility

iV-Active

Special Highlights

Funding
Project Submitted for TM R&D Funding Year 2020

Intellectual Property
Submitted Copyright Application to CIC

Participation
Participated in MP Sepang Innovation Competition 2020

Publication
1 Indexed Journal (Under Review)

Industry Partner
IRIZ Half-Cut Car

Potential Outreach

Consumers (Drivers)
Approximately 600,000 cars are sold yearly. In Malaysia, there are two local car manufacturers.

Transportation Companies
There are approximately 3000 transportation companies available.

Sustainability

PROSPECTS

COLLABORATORS

Grab

BAS SMART SELANGOR

PROTON

TM Research & Development

Life Made Easier™ | TM Group

IoT Based Smart Parking System

Assoc. Prof. Dr. Shohel Sayeed
Dr. Siti Fatimah Binti Abdul Razak
Huzaifah Abdulrahim

Abstract 01

IoT Based Smart Parking System is a system which is developed term of hardware that is used to detect the empty parking slots in the parking area then shows the availability of these lots for the users through a web application which will be connected to a cloud and allow people to check parking availability from anywhere. Maps API is also used to help the user in detecting the parking area location, along with navigation map which will rout the user to the desired parking area. The system hardware consists of two main components which are Ultrasonic sensors and Raspberry Pi, (sensors will send sensed data to the Raspberry Pi) and then collects the data and sent it to IoT cloud through the network.

02 Proposed System

A. Project Overview

The project consists of two main parts which are the Ultrasonic Sensor and a Raspberry Pi. Sensors will be connected to the Raspberry Pi, then the Pi will interact with an IoT cloud where it will be responsible to transmit and receive information from and to the cloud. After that the Webpage/ Web application will allow the user to monitor parking spots through their smart device. The over all and the connectivity diagrams of the system are shown in 03.

Upon user arrival to the parking area, user has to scan QR code which redirects to the web application, from there the user can view available parking.

B. Connectivity Overview

Pi is connected to ThingSpeak IoT cloud using MQTT protocol, which is commonly used in IoT applications to connect low levels devices and sensors.

MQTT is a publish/subscribe protocol where the publisher sends a certain type of data and the subscriber received its desired type of data in which in this case Raspberry Pi works as a publisher to send sensors data.

1. A connection need to be established before transmitting data.
2. The client sends a connect request to the cloud broker where API key and field are being verified.
3. After the verification the cloud broker will send a connect acknowledgement to the client in order to publish the connection.
4. Connection is made and transmission is ready.

MQTT passes a short message to and from cloud broker, this message contains values taken by the sensors, which is visualized and analysed later.

03 Overall Diagram
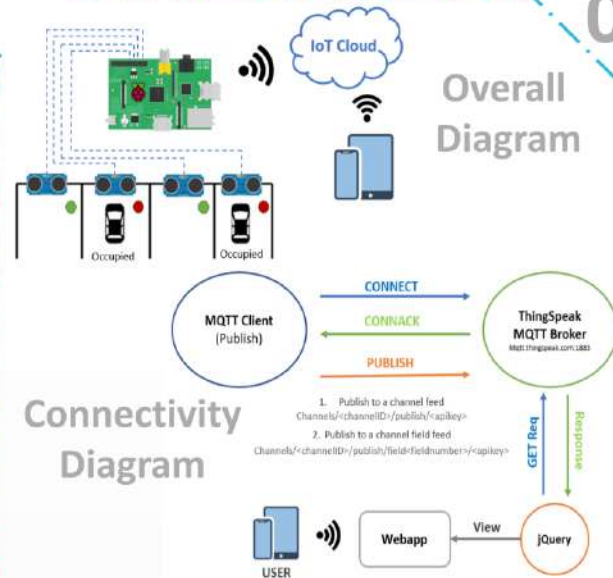
Connectivity Diagram

UI

KEY FEATURES
- Real time parking detection
- Real time sensor data visualization
- Real time parking slots and sensors monitoring over the Internet
- Green innovation, less parking time therefore reducing CO_2 emission
- Copyrighted

Conclusion 04

The aim of this project is to make vehicle parking activity easier for the society. Finding parking lot in a big parking area or multi-level parking is so frustrating and time consuming especially nowadays where everything is growing super-fast. Therefore we need every hour to keep up with this dramatic growth, so as we can observe that this type of systems can transfer our society to another level of conveniently.

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LOVE SHARING APP

Jia-Wei Goh, Choo-Kim Tan
Multimedia University

ABSTRACT

Love sharing app is a mobile application that provides a platform for users to raise money for charity. This app provides a seamless link between public institutions and people to promote the good to the society. This application provides users with detailed information about those who need help. The charity is categorized into many areas, such as single parent, orphanage, etc. Each area has relevant information for users to make their own donation decisions[1]. Findings showed the app could help more needy people.

METHODS & MATERIALS

- System Development Life Cycle
- Draw.io
- Adobe Experience Design CC
- Firebase
- Android Studio
- The survey was conducted and involved 30 respondents.

OBJECTIVES

- To develop a secured app for donation.
- To develop an app for creating a good social environment and promote justice and love.
- To promote fiscal openness and public transparency.

RESULT

Figure shows that 53.3% of respondents strongly agree that this application can help people in needs.

This application can help more people in need
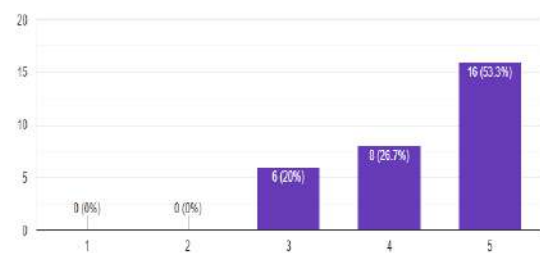30 responses

CONCLUSION

- The application promotes a loving society and helps many needy people.
- The use of this application can be further extended to a wider range of donation and to worldwide.
- It is hoped that this application can be used well in the future to create a warm society.

VALUE ADDED

- The app could be benchmarked for other type of platforms which help society and community in raising fund and providing love and care.
- The app benefits donors, organizations, community and government in promoting a caring, loving and harmony society.

REFERENCE

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MIRROR THERAPY FOR STROKE REHABILITATION VIA VIRTUAL REALITY

Wong Yue Hxen, Lim Sin Ting, Desmond Kho Teck Kiang

Faculty of Engineering and Technology, Multimedia University, Melaka

Problem Statement

Stroke patients often depend on others for transportation to the facilities and usually are limited by the schedule of the staff. A possible solution is to create an user-friendly virtual reality therapy to enable patients to perform their own training. A home-based Mirror Therapy is also beneficial in times of a pandemic.

Objective

To design and develop a Mirror Therapy program using virtual reality as a training aid for stroke rehabilitation
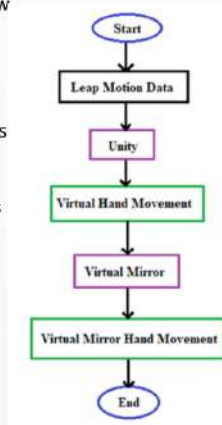
Significance

The developed program would significantly enhance the quality of life of a patient, speeding up the rehabilitation process by enabling the training to be performed more regularly and thus reducing the cost of training by minimizing the costs of transport and hospital administration.

Research Area

The theory of Mirror Therapy is the use of a mirror to create an illusionary image of an affected limb that has happened without pain to trick the brain into thinking of motion. Studies show that stroke rehabilitation benefits from virtual reality therapy because it triggers many regions of the brain, including the mirror neuron system and ultimately promotes the formation of new nerve cells This study seeks to combine both mirror therapy and virtual reality to provide a more wholesome experience to patients undergoing rehabilitation.

Hardware & Software Setup:
- Smartphone-based Head Mounted Device
- Leap Motion Controller
- Personal Computer
- Unity Game Engine
- TrinusVR

Start → Leap Motion Data → Unity → Virtual Hand Movement → Virtual Mirror → Virtual Mirror Hand Movement → End

Results

After the development was completed, a public testing was conducted to invite volunteers to play test the game.

A survey was handed to the volunteers after the play test to collect data and feedbacks.

Average Playtime	5 to 10 minutes
Average Engagement Rating	3.8 out of 5
Average Helpfulness Rating	4.3 out of 5

93.5% of the participants had some prior knowledge regarding virtual reality but had never experienced any in their life.

The implementation of leap motion controller in a virtual reality training was observed to be an interesting experience for 84.4% of the participants as the game captured their attention for 5 to 10 minutes.

90.6% of participants rated the engagement level highly with a 3 and above on a scale of 1 to 5 with 5 being the most engaging

87.5% of respondents rated it highly from 4 and above when asked to rate helpfulness level.

All the participants who lacked virtual reality experience were able to adept to the virtual reality experience within 10 minutes when continuous attempts were given.

Conclusion

With the new understanding in the field of virtual reality, a 3D virtual world was created for the purpose of developing a mirror therapy to aid upper limb recovery training. Modern tools such as leap motion controller were used to implement a solution. From the overall positive feedback from the public testing, the end product was considered to be promising. Further exploration can be conducted so that the application is ready to be used in a Telemedicine setting.

MOBILENET WITH 1D-CONVOLUTIONAL NEURAL NETWORK FOR ACOUSTIC EVENT DETECTION

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Abstract

This study focuses on acoustic event detection (AED) which leverage both frequency spectrogram and deep learning methods. A spectrogram is first generated from acoustic data using frequency spectrogram technique and fed into a pre-trained MobileNet [4] to extract robust features representations. 1 Dimensional Convolutional Neural Network (1D-CNN) is then adopted to train AED model which consist of several alternatives of convolution and pooling layers. The last pooling layer is flattened and fed into a fully connected layer for classification. The proposed method is evaluated with three datasets: Soundscapes1, Soundscapes2, and UrbanSound8k which obtained 81, 86, and 70 F1-score, respectively.

Experiment and Analysis

Method	Proposed by	Soundscapes 1	Soundscapes 2	UrbanSound8k
64 log mel-band magnitudes + CRNN	[1]	72.3	70	65
SB-CNN	[2]	76.5	69.1	69
1MaxCNN-E-MC	[3]	69.7	66	61.5
Frequency Spectrogram + MobileNet + 1D-CNN	Ours Proposed Method	81	86.1	70.5

Research Methodology

PRE-TRAINED MOBILENET

1D-CONVOLUTIONAL NEURAL NETWORK
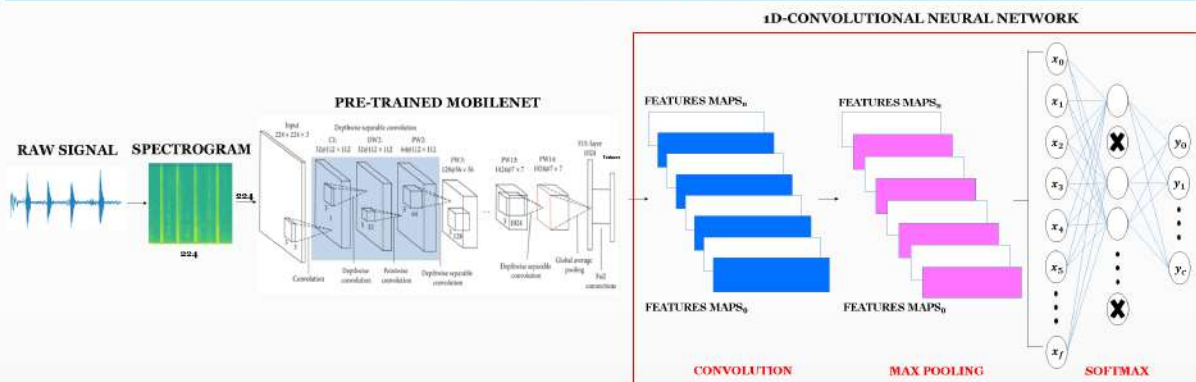
Conclusions

✓ Proposed an acoustic event detection model that well classify the dataset with moderate size.

✓ Two data augmentation techniques are utilise in this study which are speed tuning and pitch shifting.

✓ Proposed a deep architecture that implement frequency spectrogram, pre-trained MobileNet and 1D-CNN.

✓ Proposed method is outperforms several existing acoustic event detection models [1-3].

✓ Proposed deep architecture can be further enhanced via solving overlapping sounds.

References

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SIGNSCAN – SIGNAGE CLASSIFICATION AND NOTIFICATION: AN AUTOMATIC SIGN RECOGNITION SYSTEM

Ir. Dr. Goh Vik Tor	Dr. Timothy Yap Tzen Vun	En. Hairol Azman bin Razali
Mr. Mohamed Eltag Salih Saeed	Dr. Ng Hu	En. Mohd Azizi bin Kholid
Dr. Chin Ji Jian		
FOE, Multimedia University	FCI, Multimedia University	Jabatan Penguatkuasaan MPS

SMARTPHONE → Firebase / amazon Rekognition (CLOUD-BASED SERVICES) → WEB DASHBOARD

OVERVIEW

Authorities expend tremendous effort to document and remove illegal signage promoting illicit activities. **We propose a machine-learning based system that can record, classify, and track these illegal signs.** The system consists of a smartphone app that captures photos of signs and extracts information from them, a cloud-based database to store the information, and a web-based dashboard. **This system can automatically extract pertinent information such as phone number, type of advertisement and GPS location from these signs.**

RESULTS

In collaboration with Majlis Perbandaran Sepang, real-world experiments were carried out to determine functionality and accuracy of SignSCAN.

Recognized Signs

Date	Time	Business Type	Phone Number	Location	Latitude	Longitude	Image
13-08-2019	15:41:37	Money Lending	0182800520	Solstice Rd, Cyberjaya, 63000 Cyberjaya, Selangor, Malaysia	2.9254559	101.6359407	
13-08-2019	16:34:23	Money Lending	0136581171	Solstice Rd, Cyberjaya, 63000 Cyberjaya, Selangor, Malaysia	2.9248654	101.6356166	

Business Type	Sample Size	Classification Accuracy	Phone Number Accuracy
Money Lending	17	94%	94%
House Moving	6	100%	83%
House Cleaning	3	100%	100%
House Sale	3	100%	100%
Education	1	100%	100%
Overall	30	97%	93%

KEY FEATURES

Scalable – App usage can be expanded to other municipalities
Cost-effective – Uses affordable cloud-based services
**Quick** – Improved efficiency with short turnaround time

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Simulating Difficulty Adjustment in Proof-of-Work Blockchains with SimBlock

Chin Zi Hau[1], Dr. Timothy Yap Tzen Vun[1], Dr. Ian Tan Kim Teck[2]
Multimedia University[1], Monash University Malaysia[2]

Abstract

Blockchain, a distributed, decentralized, and public digital ledger technology is represented by a gradually increasing list of "blocks" containing information that are linked together using cryptographic hashes. However, performing studies on actual blockchain networks remain challenging as they may involve many nodes or these nodes could be placed in different geographical regions. Simulators for Proof-of-Work blockchain exists to facilitate this, but features such as difficulty adjustment or dynamic hash rate are not available. Using SimBlock, a blockchain network simulator as a base, difficulty adjustment algorithm and the capacity to increase or decrease hash rate dynamically were added to the simulator.

Methods
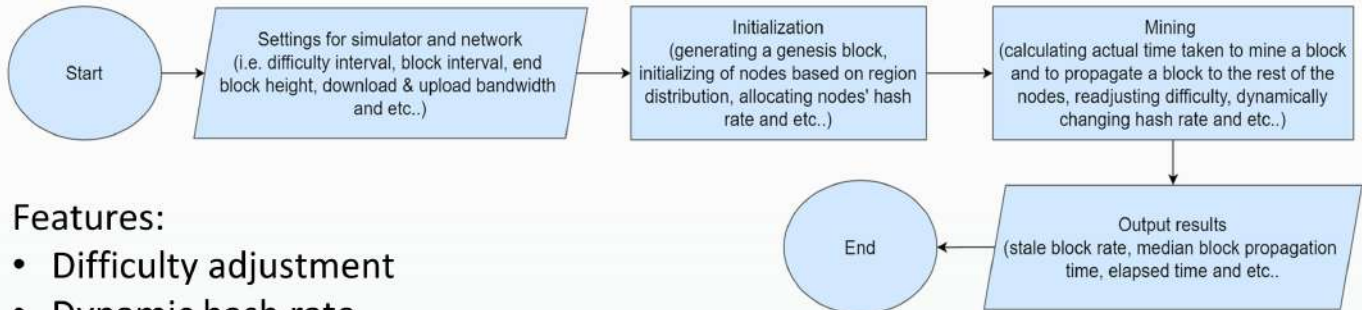
Features:
- Difficulty adjustment
- Dynamic hash rate

Results

Comparison between SimBlock and the proposed implementation in terms of median block propagation (t_{MBP}), rate of fork (r_s) and the average of actual time taken to mine a block (t_b).

	Fixed network hash rate			Dynamic network hash rate			Dynamic network hash rate (2019)		
	t_{MBP}	r_s	t_b	t_{MBP}	r_s	t_b	t_{MBP}	r_s	t_b
SimBlock	9.304s	0.70%	634.35s	9.3252s	0.85%	534.55s	3.809s	0.40%	415s
Proposed implementation	9.307s	0.76%	604.05s	9.3257s	0.78%	557.4s	3.805s	0.32%	521s

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SMART TOILET 2.0
IOT IMPLEMENTATION FOR RESOURCES OPTIMIZATION DRIVING A USER-CENTRIC SYSTEM DESIGN

TS. DR R KANESARAJ RAMASAMY [PROJECT LEADER]
PROF DR HO CHIN KUAN,
DR INTAN SORAYA ROSDI, DR NURAZLIN MOHD FAUZI, DR RUZANNA AB RAZAK
VENUSHINI RAJENDRAN, AMAR BIN LOKMAN, YOGAN NADARAJAH, KIRENRAJ RAJENDRAN

SURVIVABILITY MODEL FOR OSTEOSARCOMA

Saravanan Muthaiyah[1]
[1]Multimedia University, Jalan Multimedia 63100 Cyberjaya, Selangor, Malaysia

INTRODUCTION

Improving survivability prediction for cancer significantly improves decision making of families, patients, care givers and the health care medical team. This includes decisions to continue with life sustaining treatments that includes chemotherapy and radiation therapy. This study is focused on survivability prediction or better known as prognosis for Osteosarcoma. The study employs machine learning techniques that are based on binary classification methods with the aim to develop a more accurate prognosis model. The prediction model employs a supervised machine learning techniques. Given that the tumor develops in areas of rapid bone turnover, most frequently occurring in the distal femur and proximal tibia of adolescents. To resolve the overfitting problem, cross-validation method was used to provide a more accurate performance estimate for the prognosis model.

DATA PREPARATION

The following problems were found to be commonplace within the data set, along with the steps taken to resolve the problems.

i. Missing values: Some patients did not have values present for certain attributes. These missing values were rectified by inserting default values that are suitable with the attribute in question.

ii. Values with non-standardised wording: A single attribute may have different values that have the same intended meaning (e.g. "defaulted" and "defaulter" both meaning that the patient has defaulted from the study). These values were standardised using a common value which is usually done by selecting one of the values in the domain.

iii. Trailing whitespaces: A single attribute may have values that look similar at first glance, but in actuality have trailing whitespaces that cause the analysis program to interpret it as different values altogether (e.g. "Yes" and "Yes " with an additional space at the end). These values were standardised by removing the whitespaces.

iv. Multivalued attributes: One attribute in particular, which is metastasis location, contains multiple values in a single patient entry as the patient may experience metastatic growths in more than one location. In the initial data set, these values are combined into a single string with various non-standardised separator characters. These values were split up and assigned as multivalued lists for each patient entry to improve analysis capabilities.

EVALUATION AND RESULTS

To evaluate the performance of each binary classification model, the true positive rates and false positive rates for each model are taken and supplied to a ROC curve generator. The area under the ROC curve (AUC) indicates the probability of the model to accurately predict the survival of an osteosarcoma patient. The AUC values for each value are then taken for comparison against each other to determine the prognostic model that has the best accuracy in predicting patient survival. Using the patient survival length data that is present within the data set, a Kaplan-Meier analysis is performed to discover the survivability rate of the osteosarcoma patients that are being studied as part of this research. The Kaplan-Meier curves for patient survival after 2 years and 5 years can be seen in Figure 1 and Figure 2, respectively. Meanwhile, the exact Kaplan-Meier estimator values obtained are recorded in Table 1. From the obtained results, the Kaplan-Meier estimator denotes that 65.6% of the studied patients are able to survive the osteosarcoma disease beyond 2 years and only 45.3% are able to survive beyond 5 years.
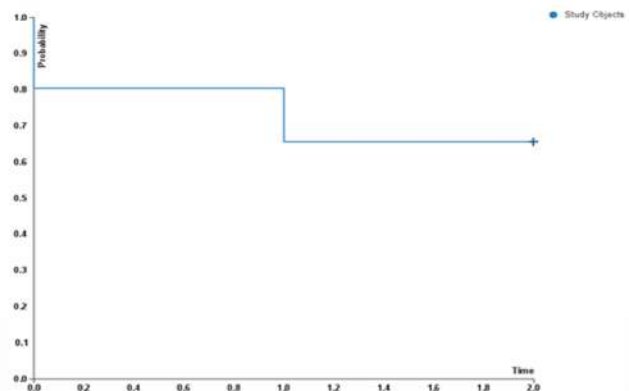

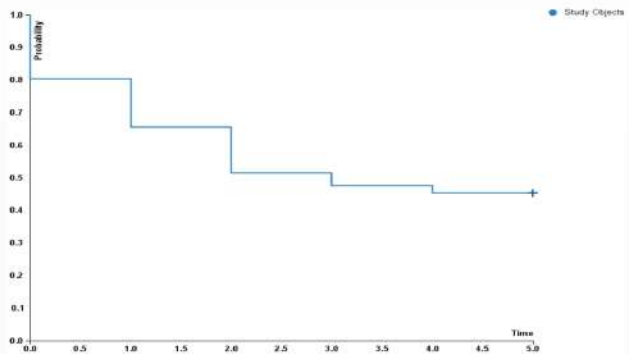Figure 1: Survival after 2 years

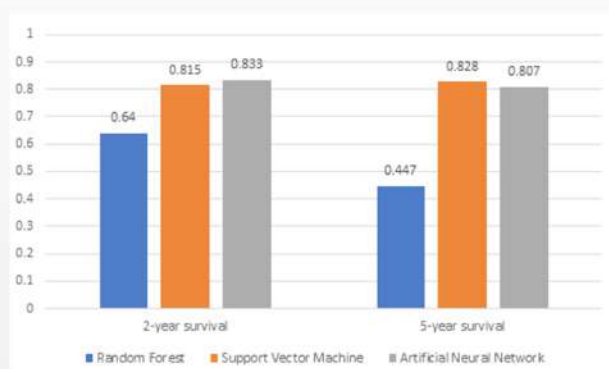Figure 2: Survival after 5 years

Figure 3: Survival after 5 years

COMMERCIALIZATION

This development has great potential for commercialization as it can be extended to other types of cancers as well.

Analysis of Comparison Performance with Six Activation Functions for Wearable-Sensor Based Gait Analysis with GIGRKELM Method

Jessica Permatasari, Dr. Tee Connie and Dr. Ong Thian Song

Abstract

With the rapid development of microelectromechanical system (MEMS), mobile devices have been equipped with more sensors. The use of inertial measurement unit (IMU) sensors (e.g. accelerometer and gyroscope) embedded in the smartphone for gait analysis has received much interest because it is unobtrusive and user friendly. In this study, we introduced Gait Inertial Gaussian Kernels with Randomized Kernel Extreme Learning Machine (GIGRKELM) method for wearable-sensor based gait analysis. First, the covariance matrices were used to fuse the signals from accelerometer and gyroscope. Then, Positive Definite Gaussian Kernel functions were employed to embed the manifold value points to a higher dimensional Reproducing Kernel Hilbert Space (RKHS). In order to achieve good performance for classification result, activation function as one of the important factors plays an important role. Therefore, this research study focused on the comparison of performance analysis on six activation functions namely the sigmoid, RBF, sin, tribas, tanh and hardlimit with the proposed GIGRKELM method.

Keywords: Activation function, covariance matrices, extreme learning machines(ELMs), gait recognition, sensor fusion.

Introduction

Wearable sensor has emerged as a revolutionary technology in many application domains since it does not require any intervention from the user. In this study a wearable-sensor based gait analysis with GIGRKELM method is proposed. The covariance matrix approach is introduced to fuse meaningful information from both accelerometer and gyroscope sensors. The covariance matrices are robust against noises as noises that present in the individual sample data are largely filtered out with an average filter during covariance computation. Specifically, Four different Positive Definite Gaussian Kernels are evaluated under the proposed GIGRKELM method on a self-collected dataset known as MMUISD. The objective of this research is to find the activation function that can give the best performance for classification result.
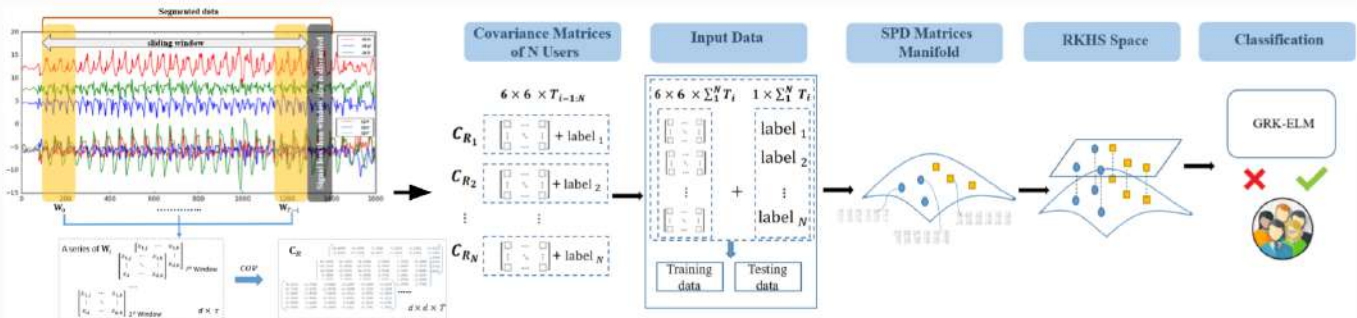
Methods

Figure 1. Overview of the GIGRKELM Method

Results

A total of 330 participants' signals data of fast walking speed from pocket, hand and bag sensor positions were used in this experiment with window size of 150. Four Positive Definite Gaussian Kernel functions with six activation functions were evaluated to find the activation function that could give the best performance results.
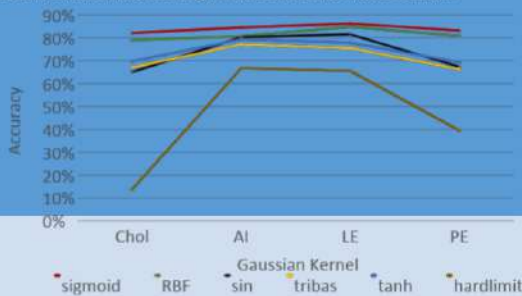
Conclusion

- Sigmoid activation function achieved the best performance compared to the other activation functions. RBF activation function yields as the second position after sigmoid activation function.
- From the result, it can be clearly seen that sin, tribas and tanh activation functions generated the performance results with the accuracy range is quite close to each other. Meanwhile, hardlimit activation function yield as the worst performance compared to the other activation functions with the worst performance was obtained with the Cholesky kernel.
- The experiment found clear evidence that sigmoid and RBF activation functions gave the first and second highest performance. The result led to the applicability of sigmoid and RBF activation functions for the experiments with the proposed method GIGRKELM and the comparison with previous work methods.

References

- Permatasari J., Connie T., Song O.T. (2020) The MMUISD Gait Database and Performance Evaluation Compared to Public Inertial Sensor Gait Databases. Lecture Notes in Electrical Engineering, vol 603. Springer, Singapore. [https://doi.org/10.1007/978-981-15-0058-9_19]
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DIDI THE EXPLORER MOBILE GAME

Student Name: Juniza binti Zamri
Lecturer: Dr. Tenku Putri Norishah Tenku Shariman

PRODUCT DESCRIPTION

Didi the Explorer is a mobile educational application created for children to learn numbers in Arabic. Emphasis is placed on pronunciation and recognizing Arabic numerals, which is a common obstacle for non-native learners due to the lack of similarity between the phonemes in many of the world's languages with the phonemes that exist in the Arabic language. Additionally, the importance of learning Arabic weighs significantly in religious studies seeing that the Holy Quran is written in Arabic. The challenges in recognising and pronouncing Arabic words can be addressed by using an educational app that engages students effectively with an attractive and interactive content.

NOVELTY

According to Mayer's cognitive theory of multimedia learning, students learn better via multiple channels when processing information in the form of text, images, audio and video, which must adhere to certain design and organizational principles. As such, this development emphasises the elements of multimedia to foster the teaching and learning process through an interactive, fun, and effective way.

APPLICABILITY

The challenges faced in recognising and pronouncing Arabic words can be addressed by using an educational app that engages students effectively with an attractive and interactive content. Hence, adapting this application for usage in schools and at home can potentially instil a greater interest in exploring the Arabic language in-depth.

COMMERCIALIZATION

This application has been published in Windows format for desktop user as a prototype version while the final completion will be published into the Google Play Store to be accessed by all users. The application can be used by Arabic teacher in school as part of the teaching and learning tools as well as an asynchronous learning tool that can be used at home.

ACKNOWLEDGEMENT

Special thanks to:
Scholarship Support –
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Jabatan Pengajian Politeknik (JPP),

Dr. Tenku Putri Norishah Tenku Shariman
(Lecturer)
MME7113 – Principle of Multimedia in Education Technology.
Masters of Multimedia (e-Learning Technologies), MMU.

RECOGNITION

GOLD AWARD

INTERNATIONAL INVENTION & INNOVATIVE COMPETITION
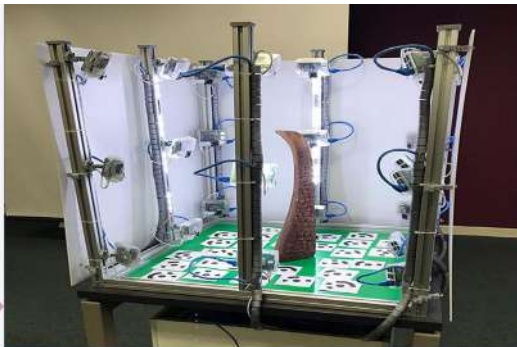
InIIC Series 2/2020
30 October 2020

PRODUCT SCREENSHOT

MULTI 3DSCAN
Portable Multi-purpose 3D Photogrammetry Scanning Array System

Project Leader: Dr. Tenku Putri Norishah Tenku Shariman
Mazlan Mahadzir, Associate Professor Dr. Wong Chee Onn,
Dr. Mohd. Hafizuddin Mohd. Yusof, Sri Kusuma Wati Mohd Daud
(Faculty of Creative Multimedia, Multimedia University)

The system uses "Raspberry Pi 3", a single board minicomputer that is attached to its camera module (Pi Camera NoIR) to capture and scan an object.

PRODUCT DESCRIPTION

3D scanning is becoming a technology of choice for the 3D digitization of objects and photogrammetry which is commonly used as a low cost and versatile technique. The prototype developed is a portable photogrammetry system which can specifically execute the following tasks:

1. Design and develop a 3D reconstruction system that can scan multiple 2D images and reconstruct the images into a 3D model.
2. Design and develop 3D modelling process using photogrammetry for VR and MR
3. Design and construct a portable modular (rig) system that consist of the Raspberry Pi and its camera (PiCam NoIR) in order to capture and object and its surroundings

METHOD

1. To create a 3D model via photogrammetry, many photos were taken of the desired object.
2. These photos were taken from different angles using a multi-camera setup to capture each part of the object's geometry which should overlap slightly from one photo to the next.
3. Once all the photos have been taken, they are imported into the software to be aligned. The software does this by using image processing to find reference points in the texture of the overlapping photos.
4. From this alignment of all the photos, the software then plots data points using triangulation to calculate the distance and location of each feature in three-dimensional space. This forms a point cloud so that the software can create a polygon mesh just like 3D scanning to create 3 models.

RESULTS AND DISCUSSION

- This results have indicated a complete process of creating a virtual 3D model, from approaching the physical object to the final virtual 3D model that is valuable for further use in any project that requires 3D model content, for example for digital marketing or digital training purposes.
- Highly reflective surfaces tend to generate a lot of "noise". To offer an alternative solution, the study had analyzed the spectral photogrammetry technique. Spectral photogrammetry is an emerging technique which uses images at different wavelengths to create 3D models.

Communication Architecture

Reconstruct the captured images into a 3D model
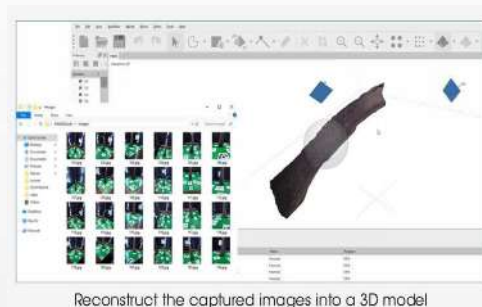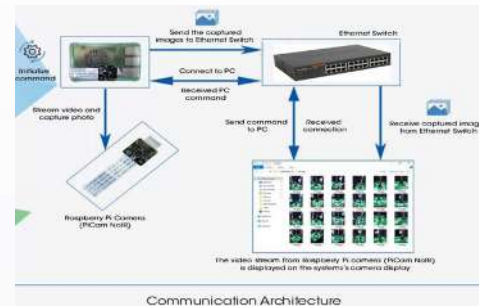
CONCLUSION

The research has concluded on the most suitable 3D model, with the best ratio of reconstruction time and quality that complies with the formats required for storage, editing, viewing and displaying 3D models and the obtained 3D model is split into information about the three-dimensional form of the object (virtual record of all the points in space) and information about the colour of the object and its texture.

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PUDU VR THE FINAL YEAR PROJECT :
ASSIMILATION OF CULTURAL CONTENT INTO POPULAR CULTURE

Erwin Abd Jabbar, Dendi Permadi, Mazlan Mahadzir, Adnan Arif Jazlan,
Amirul Afiq Abdul Muzi, Nur Zuhairda Jasanuar, Amer Faiz Fatah

P.U.D.U.

PROJECT UNIFYING DEAD UNDERWORLD

CONTENT DESIGN

P.U.D.U VR (Project Unifying Dread Underworld) is a sci-fi survival horror game that immerses players in a conceptualize imprisonment facility of the future, situated on the moon to commemorate the demolished PUDU prison.

The facility is surrounded by failed experiments of mutated prisoners created through cross-gene human and metaphysical Malaysian ghost such as the 'pontianak' and 'hantu raya'. The gameplay goal is to escape from the mutated prisoners and defeat the evil scientist-shaman (bomoh) who practices scientific-witchcraft.

INTRODUCTION

P.U.D.U VR is a virtual reality game that is customised in the futuristic setting that assimilates Malaysian content and has semiotics featured in the concept design of character, spatial environment and interaction. The content follows an ever-popular game content; role playing contextual narrative, first person shooting gameplay, and position horror-massacre content. Adaptation of Malaysian semiotic is reflected through its positioning conceptual narrative portraying the mystical lore and belief subjected to shamanic and necromancy.

VR content development provides opportunity to introduce local customs and belief in representing conceptualize events in addressing cultural lore, customary behavioral learning and critical thinking.

ISSUES HIGHLIGHT

- Critical to introduce local content and symbolic authenticity of ethnicity through commercial popular culture to establish a sense of identity and familiarization to Malaysian culture.

- Adopt the challenge to position cultural narrative; mystical lore, adaptation of behavioral and belief to be simulated as VR content

- Imply cultural integrity to familiarize local thus worldwide adaption within conceptualize events and content visualization.

- The rising number of people now engage with VR platform seeking for new experience and content development.

VR CONTENT Assimilate cultural semiotic within sci-fi spatial setting.

■ Tangible assets ::
Character designs, mystical / metaphysical creature design, semiotic positioning through spatial assets, ambience setting

■ Intangible heritages ::
Languages, showcase moral values, behavioral customs traditions, mystical and witchcraft believes inherited from past generations as cultural lore.

■ Cognitive experience ::
Interlaced imaginative cultural content visions, connotation and denotation within symbolism featured throughout visual design, interactions design and narrative gameplay bindings.
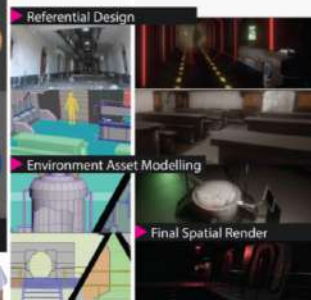
■ Interactive visual narrative ::
Horror gameplay setting; established through crafted scare tactics, subjected to association to local mystical creature established.

■ Behavioral interactive setting ::
Positioning local values through narrative progression. Sample on speeches, narrative interaction and gameplay task performed.

■ Emotional setting ::
Invoking sense of connection through asset features, situational design and spatial composite. e.g.: Portrayal of incent cognitively synonymous with black arts customary and ritual often associate with sinister intention.

▸ Preliminary Ideation and Sketches

▸ Referential Design

▸ Environment Asset Modelling

▸ Final Spatial Render

▸ Interactive Assets

▸ Interactive Narration

▸ Character Modelling

▸ Final Render Low-poly Model

▸ Mesh Room 3D Scan & R3DS Unwrap

▸ Game Ready Texturing Process

▸ Visual Benchmarking

▸ Interaction Module

VR CONTENT DEVELOPMENT

Character Development
Since the gameplay centers on narrative base progression, establishing an effective visual representation for each characters is crucial.

Spatial Environment
Establish a sense of thematic conceptualize sci-fi environment by laying ground system for pathfinding and assimilate cultural semiotic components.

VR Programming
Strategic craft of interaction system to simulate cultural values adapted within situational gameplay design.

SMART MIXED REALITY MOBILE APPLICATION FOR GUIDED AIRCRAFT MAINTENANCE LEARNING

Safinaz Binti Mustapha, Cyprian Aidan Chong, Dr. Rusyaizila Binti Ramli

Eden

Eden is a mobile application that deployed the mixed reality technology focusing on developing automotive learning and training solution with the integration of industrial revolution 4.0 technology in augmented human's intelligent.

PROBLEM STATEMENT

The manual content is difficult due to insufficient interactive visual overview.

Limited access to the physical item, as explained in the manual. It depends on the practical session which is also not frequently available at all time.

OBJECTIVES

To create an interactive learning module by deploying the MR technology in mobile phone.

PRODUCT CERTIFICATIONS

Copyright :
AR2020000566

NOVELTY AND INVENTIVENESS

Interactive   Collaborative   Portability   User Ready

By maximize the boundaries of a smartphone, integrating mixed reality into a smartphone will be the next outbreak in the coming future. Eden aims to focused on integrating a mobile mixed reality solution in aircraft learning and training to promote an interactive learning experience, especially aircraft and automotive. The learning modules will be narrowed down to basic aircraft airframe and engine structure.

AWARDS AND RECOGNITIONS

MTE2020 - Invention and Innovation Awards - Gold Award
MTE2020 - Invention and Innovation Awards - The Best Award
ITEX2020 - Gold Award

APPLICABILITY

The application can be deployed to the university/college, aircraft maintenance training institute, aircraft maintenance ground, presentation purpose in breaking down the complex structure to a visual, workshop, and any organization that required support aid in aircraft and automotive learning and training for 21st-century learning and training experience solutions.
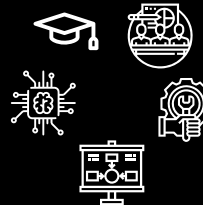
3DEXCITE Augmented Reality at The Launch of Dongfeng Nissan's New Teana model

MARKET POTENTIAL

In today era, smartphone are owned widely around the world and every year the smartphone is getting advance in terms of its performance. Hence, this will also gave an impact on the growth of mobile AR and MR in mobile for each year, the future is getting close. The new outbreak will open more opportunities for such an application. The first industry that will be wrapping around this technology is automotive along with aircraft as it can enhance productivity.
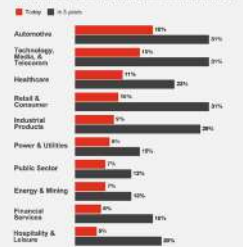
Eden less than RM1,299

oculus RM1,653

Microsoft HoloLens RM14,505

Virtual Reality Simulation Kit for Nanotechnology Procedural Practice

Dendi Permadi, Cheong Soon Nyean, Elyna Amir Sharji, Chu Hong Yang, Tan Ingemm Niccus, Yeap Seow Sien, Danial Hasyeimi
Faculty of Creative Multimedia (FCM)

Introduction

This project is a Virtual Reality (VR) simulation based on actual nanotechnology laboratory, users can fully immerse themselves in the virtual environment and conduct nanotechnology procedural practice process virtually.

Safety protocols must be incorporated to ensure the safety in the nanotechnology procedural activity (Kulinowski and Jaffe, 2009; NIOSH, 2009). Learning with immersive VR provides pre-training experience to the learner. A VR simulation with a computer-controlled technology enables the learner to practice and repeat procedures as often as necessary in order to correct mistakes and optimize the process outcomes. They can fine-tune their skills and conduct experiment without compromising the safety risks and dangerousness.

Methodology

This study adopts phases of methodology proposed by Vaishnavi and Kuechler (2008) which consist of awareness of problems, suggestion and development.
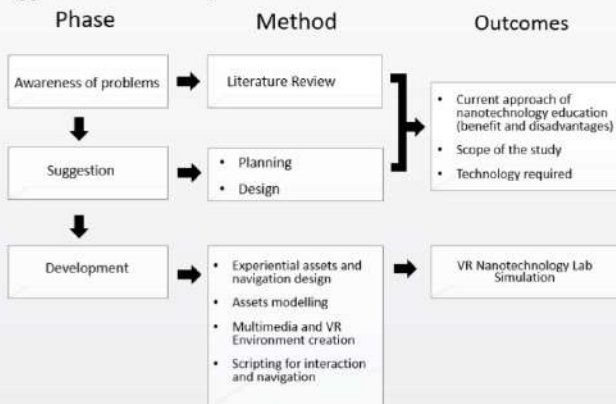
Discussion and Conclusions

Human error can contribute to the issue of safety during the learning process in the real nanotechnology lab. A more practical, safe, feasible and cost effective solution is needed to provide for the students. Fazarro (2011) addressed the needs for the safety training procedures, in which people need to complete virtual training before they work with hazardous materials. Thus, the proposed virtual reality simulation kit developed through this study can be an alternative approach in enhancing students' learning experience and their safety to conduct the laboratory experiment.

This is inline with the interest of current young generation who are curious and easily attracted to the new approach of fun and interactive learning. It is hoped that this research project will be able to provide a solution to the issue of nanotechnology education.

References

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Commercialization

- Potential partners in nanotechnology safety programme.
- **STEAM**VR

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ACKNOWLEDGEMENT

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