

Jeong-Jin Kang
Edward J. Rothwell
Yang Hao
Jongwook Jang

Advanced and Applied Convergence Letters

AACL 17

Advanced and Applied Convergence & Advanced Culture Technology

**9th International Symposium, ISAAC 2021
in Conjunction with ICACT 2021, ICKAI 2021**

**November 11 - 13, 2021, SETEC, Korea
Revised Selected Papers**

Volume Editors:

Jeong-Jin Kang

Dong Seoul University, 423 Bokjeong-Dong, Sujeong-Gu, Seongnam, Gyunggi, 13117 Korea
E-mail: jjkang@du.ac.kr

Edward J. Rothwell

Michigan State University, 2120 Engineering Building East Lansing, MI 48824-1226, USA
E-mail: rothwell@egr.msu.edu

Yang Hao

Queen Mary University of London, Mile End Road, London E1 4NS, UK
y.hao@qmul.ac.uk

Jongwook Jang

Donggeui University, 176, Eomgwang-ro, Busanjin-gu, Busan, Korea
jwjang@deu.ac.kr

ISSN: 2288-6060

Copyright ©The Institute of Internet, Broadcasting and Communication (IIBC) All rights reserved
Copyright and Reprint Permissions: This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in any other way. Abstracting is permitted with the credit to the source.

Other copying, reprint request should be addressed to: IIBC Copyrights Manager, Head Office

101 Jungdae-ro, Dongbu Sunville #610, Songpa-gu, Seoul, 05719 Korea
Tel: +82 2-407-7718 Fax: +82 2-407-7716

* Printed on acid-free paper

Please note that the papers in this proceeding book are neither reviewed by peer or professional editor nor accepted as official papers. The papers are working papers that the authors study their research recently.

A Study on Honeybee Movement Measurement System Using Photo Detector / 157

Kim Joon Ho, Seo Hee, Han Wook, Chung Wonki

Summary of Prototyping Implementation of the effective Vehicle Identification System Using EfficientNet Model / 162

Seong Mun Yun, Janghwan Kim, R. Young Chul Kim

Study of the boom shock changing-state on the messaging position / 164

Junaid Ahsenali Chaudhry, Jeong-Lae Kim, Ki-Young Lee

Inflection of the echo blasting changing-status on the routing position / 167

Michat Strzelecki, Jeong-Lae Kim

Design on display for contact of the core temperature measurement device / 170

Goreti Marreiros, Xayasith Phomchaleun, Jeong-Lae Kim

Effect of sensitivity infrared LED / 172

Kay Thwe Htun, Jeong-Lae Kim, Hyun-woo Jeong

Study of organized using Load cell sensor on the body condition measurement / 174

Noriyuki Iwane, Chanthajohn Mounmanivong, Jeong-Lae Kim, Woo-cheol Lee

Fire safety analysis based on different states of fire doors in high-rise apartments / 176

ZeChen,Zhang, and Ha-Sung, Kong

Evacuation safety evaluation according to the opening and closing of public library evacuation exits and relocation / 178

Kuk-Hee, Park, Ha-Sung, Kong

Evacuation safety evaluation according to whether the tourist hotel evacuation exit is open or not and the layout of the stairs / 180

Kuk-Hee, Park, Ha-Sung, Kong

Analysis of Operating Time by Type of Sprinkler Head in Indoor Gymnasium / 181

Jae-Cheon Ahn, Ha-Sung, Kong

Evacuation safety evaluation of tourist hotels according to the fire alarm method / 182

Sung-Chun, Moon, Ha-Sung, Kong

Evaluation of evacuation safety according to the number of people accommodating residential welfare facilities and the change of use of elevators. / 183

Sung-Sook, Cho, Ha-Sung, Kong

A Study on Financial Asset Prediction Using Vector Error Correction Model / 184

Chang-Ho An

An Improved Adam Algorithm using k-gradients / 187

Soyoung Chung, Min Gyo Chung

Preliminary research for non-face-to-face hair cut education / 189

Sol Han and Seongah Chin

VR Scissors and Interaction for Hair styling in New Normal Era / 192

Sangwook Yoo and Seongah Chin

Analysis on Spatial Structure of Tourism Economy in Shanxi Province of China / 195

Xin Gao, Hyung-Ho Kim and Jun-Won Yang

Summary of Prototyping Implementation of the effective Vehicle Identification System Using EfficientNet Model

Seong Mun Yun¹, Janghwan Kim², R. Young Chul Kim^{3*}

Dept. of Software and Communications Engineering, Hongik University, South Korea
¹uuk023uuk@naver.com, {²janghwan, ³bob}@hongik.ac.kr

Summary

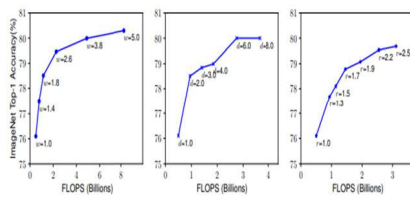
In the current uncontacted smart city environment, there are diverse needs to identify autonomous vehicles information, such as traffic flows, crime prevention, Ambulance, and traceability for efficient distribution and use of limited resources in a smart city environment. To solve this, we implement a simple license plate recognition method for vehicle inspection with CCTVs and cameras. But sometimes we get incorrect information with a damaged license plate. Therefore, we develop a data classifier to classify a particular vehicle image, which is generated using the EfficientNet model.

Keywords: Convolutional Neural Network, EfficientNet Model, Deep Learning.

1. Introduction

Real-time identification of vehicle information is required for efficient distribution and use of resources in a smart city environment. To solve this problem, we propose a prototype of a vehicle information identification application through vehicle image data using a deep learning model. This paper is organized in the following order. Chapter 2 refers to CNN models and approaches to enhance accuracy of identifying images. In Chapter 3, we propose a prototype of a vehicle identification application using the EfficientNet model. Chapter 4 discusses the limitations of the proposed method with conclusion and future research.

2. Related Works



(a)

$$\begin{aligned} \text{depth: } d &= \alpha^\phi \\ \text{width: } w &= \beta^\phi \\ \text{resolution: } r &= \gamma^\phi \\ \text{s.t. } \alpha \cdot \beta^2 \cdot \gamma^2 &\approx 2 \\ \alpha \geq 1, \beta \geq 1, \gamma \geq 1 \end{aligned}$$

(b)

Figure 1. Accuracy Result & EfficientNet Model Approach

To increase the accuracy of the existing CNN model, width scaling to increase the number of filters, depth scaling to increase the number of layers, and resolution scaling methods to increase the resolution of the input image are frequently used. ResNet is a representative model using depth scaling technique[1], and ShuffleNet is a representative model of width scaling technique. However, these approaches converge to a specific value as shown in Fig. 1(a) when the accuracy continues to rise. To use these three approaches simultaneously, there is the Compound scaling method, and the EfficientNet Model typically used these methods. This technique increases the Width, Depth, and Resolution of CNN within the constraint as shown in Fig. 1(b)[2].

3. Vehicle Identification Application Using EfficientNet

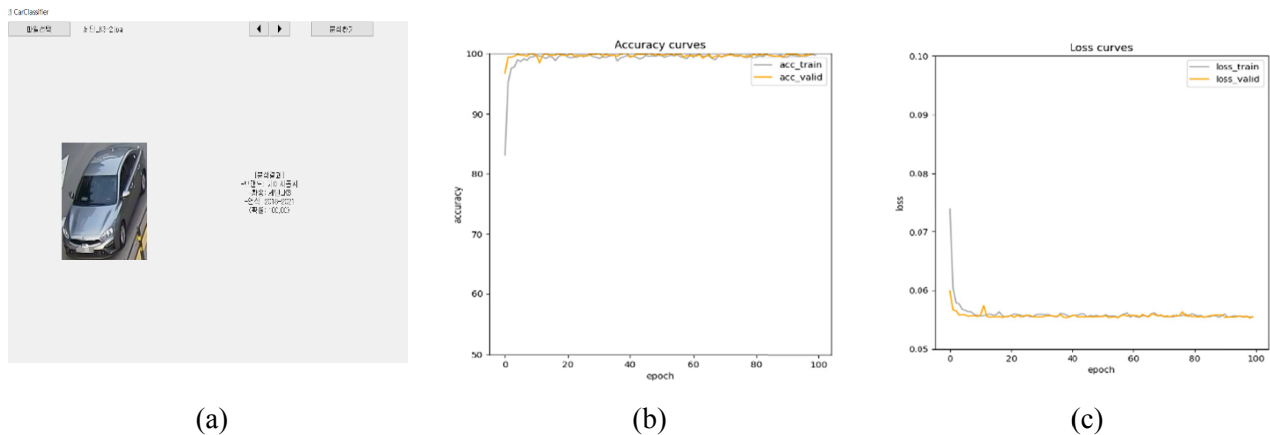


Figure 2. Application Prototype with Accuracy Graph

We trained the model through the data extracted as images using the video data collected for about 2,189 hours from CCTV and additionally installed cameras in Bucheon area. Among the EfficientNet models, the efficientnet-b4 model, which is the most efficient in computing resources when considering memory efficiency and performance, is used because models after EfficientNet-b5 may stop working depending on the system environment when the memory load increases[3]. Figure (a) is a picture of an image identification application prototype using the EfficientNet-b5 model. If the corresponding picture image is input, the vehicle model and information of the picture are identified with a high identification rate. Figure (b) shows the accuracy and (c) shows the loss curve.

4. Conclusion

This paper is a summary of the prototype of a vehicle identification application in an uncontacted smart city environment. Although there are still limitations for implementing application using the EfficientNet-b5 model, those deep learning is getting better as we research. In the future, we plan to use various deep learning models to increase the accuracy for the application.

Acknowledgement

The research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (2021R1I1A305040711), the Ministry of Education (2021R1I1A1A01044060), and the BK21 FOUR (Fostering Outstanding Universities for Research) funded by the Ministry of Education (MOE, Korea) (No.2021R1I1A305040711).

References

- [1] K. He, X. Zhang, S. Ren, and J. Sun, "Deep Residual Learning for Image recognition", arXiv, 2015.
- [2] Jae-Sik Han, Eun-Ah Choi, Eun-Byul Kim, Lee Yong-Min, and Lee Min-Ho. (2021). "Development of an EfficientNet-based Enhanced Mushroom Image Classification Model." *Proceedings of the Korean Contents Association Comprehensive Conference*, pp. 399-400. (2021)
- [3] M. Tan and Q. V. Le, "EfficientNet: Rethinking Model Scaling for Convolutional Neural Networks", *CVPR*, pp.1-11, 2019. B. Sklar, *Digital Communications*, Prentice Hall, pp. 187, 1998.