

BUSITEMA UNIVERSITY
FACULTY OF ENGINEERING
DEPARTMENT OF COMPUTER ENGINEERING
ANDROID BASED TAX VERIFICATION SYSTEM FOR TAXIS USING
IMAGE PROCESSING

BY

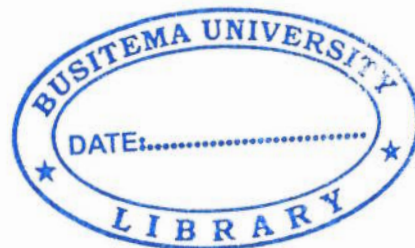
AKURE ISAAC

REG NO: BU/UP/2014/295

Email: akureisaac@gmail.com

TEL: +256706604305/+256789453618

PROJECT SUPERVISOR: MS. OWOMUGISHA GODLIVER



**A project Report submitted to the Department of Computer Engineering in Partial
Fulfillment of the Requirement for the Award of a Bachelor's Degree in Computer
Engineering of Busitema University**

May, 2018

DECLARATION

I AKURE ISAAC, declare that the project titled **ANDROID BASED TAX VERIFICATION SYSTEM FOR TAXIS USING IMAGE PROCESSING** is original and has been carefully made to the best of my knowledge and has not been submitted to any Institution of Higher Learning for any kind of award.

Sign.....

Date.....05/06/2018



APPROVAL

This project proposal report has been submitted to the Department of Computer Engineering for examination with the approval from the following supervisor.

Signature 

Date 05/06/2018

Ms. Owomugisha Godliver.

ACKNOWLEDGEMENT

Great thanks go to the Almighty God, for giving me a gift of Life and a chance of education. I greatly appreciate my parents for the support, encouragement and motivation throughout my academic carrier.

I also thank my supervisor Ms. OWOMUGISHA GODLIVER and the entire Department of Computer Engineering for the technical guidance throughout the execution of this project and my entire four years that I have spent in Busitema University.

LIST OF ACRONYMS AND ABBREVIATIONS

ALPR	Automatic License Plate Recognition
CHAR	Character
FFT	Fast Fourier Transform
KCCA	Kampala Capital City Authority
LBP	Local Binary Pattern
LPR	License Plate Recognition
MM	Millimeters
MPEG	Moving Picture Expert Group
MSER	Maximally Stable Extremal Regions
OCR	Optical Character Recognition
PX	Pixels

ABSTRACT

The android-based tax verification system for taxis using image processing will be a mobile application to help the KCCA officials to verify whether specific vehicles have cleared taxes. The system offers two schemes; the offline and online scheme. The offline scheme means to recognize the license plate performing the image processing algorithm whereas the online scheme means to verify whether the vehicle has cleared taxes by accessing and retrieving the data from the online database.

TABLE OF CONTENTS

Contents

DECLARATION	i
APPROVAL	ii
ACKNOWLEDGEMENT	iii
LIST OF ACRONYMS AND ABBREVIATIONS	iv
ABSTRACT	v
TABLE OF CONTENTS	vi
LIST OF FIGURES	x
LIST OF TABLES	xi
CHAPTER ONE: INTRODUCTION	12
1.0 Background	12
1.1 Problem statement	13
1.2 Objectives	14
1.2.1 Main objective	14
1.2.2 Specific Objectives	14
1.3 Justification	14
1.4 Scope	14
1.4.1 Technical scope	14
1.4.2 Geographical scope	14
1.5 Limitations of the system	14
CHAPTER TWO: LITERATURE REVIEW	15
2.0 Introduction	15
2.1 Key terms	15
2.1.1 Verification	15
2.1.2 Text Information Extraction	15
2.2.3 Firebase database	15
2.2.4 Text understanding	15
2.2.5 Text retrieval	15
2.2.6 Character descriptor	15
2.2.7 Character Stroke Configuration	16
2.2.8 Harris detector	16
2.2.9 MSER detector	16

2.2 Text.....	16
2.2.1 Document text footage.....	16
2.2.2 Caption text.....	16
2.2.3 Scene text.....	17
2.3 Properties of text.....	17
2.3.1 Size.....	17
2.3.2 Color.....	17
2.3.3 Motion.....	17
2.3.4 Edge.....	18
2.3.5 Compression.....	18
2.4 Text Extraction Work.....	18
2.4.1 Text extraction.....	18
2.4.1.1 Text detection.....	18
2.4.1.2 Text localization.....	18
2.3.1.2 Tracking, Extraction, and Enhancement.....	19
2.3.1.3 Text recognition.....	21
2.4.2 Searching.....	21
2.4.3 Web mining.....	21
2.5 Existing systems.....	21
2.5.1 Express penalty scheme app.....	21
2.5.2 Automatic license plate Recognition system (ALPR).....	21
2.5.3 Vehicle's RC Plate Tracking based on Image Processing Applications.....	22
2.6 Comparison of existing systems with developed system.....	22
2.7 Designed system.....	23
CHAPTER THREE: METHODOLOGY.....	24
3.0 Introduction.....	24
3.1 Requirements Elicitation.....	24
3.1.1 Library and Internet.....	24
3.1.2 Consultation.....	24
3.2 System Design.....	24
3.3 Data analysis.....	24
3.4 Testing and validation.....	25
3.4.1 Unit testing.....	25

3.4.2 Integration testing.....	25
3.4.3 System testing.....	25
CHAPTER FOUR: SYSTEM ANALYSIS AND DESIGN.....	26
4.0 System analysis.....	26
4.1 Functional analysis.....	26
4.2 Requirements analysis.....	26
4.2.1 Functional requirements.....	26
4.2.2 Non-functional requirements.....	26
4.3 System requirements.....	27
4.3.1 Software requirements.....	27
4.3.1.1 OpenALPR.....	27
4.3.1.2 React-native openALPR.....	29
4.3.1.4 Firebase.....	29
4.4 System design.....	29
4.4.1 Logical and physical design.....	29
4.6 System Operation.....	31
4.6.1 Steps taken in image processing.....	31
4.7 Database design.....	32
CHAPTER FIVE: IMPLEMENTATION AND TESTING.....	33
5.0 Introduction.....	33
5.1 Development platform.....	33
5.2 Code design.....	34
5.2.1 Code for linking with firebase and performing recognition.....	34
5.2.2 Code for linking with the trained data.....	35
5.4 Verification.....	36
5.5 Validation.....	36
5.6 Evaluation.....	36
CHAPTER SIX: DISCUSSIONS AND RECOMMENDATIONS.....	37
6.0 Discussions and recommendations.....	37
6.1 Summary of the project.....	37
6.2 Appraisal of the app.....	37
6.3 Recommendations for future work.....	37
6.4 Conclusion.....	37

REFERENCES	38
APPENDICES	40
Appendix 1	40

LIST OF FIGURES

Figure 4.1: System Flow Chart.....	30
Figure 4.2: Block diagram of the System.....	31
Figure 4.3: database design.....	32
Figure 6.1: license plate recognition.....	40
Figure 6.2: license plate verification.....	40

LIST OF TABLES

Table 2.1: Comparison of existing systems with developed system	22
---	----

CHAPTER ONE: INTRODUCTION

1.0 Background

In developing countries such as Uganda, traffic officers stop drivers on the road to check if their road tax has been renewed. Unfortunately, this sometimes causes delays for the people travelling and may even slow down the general traffic. Furthermore, for the police involved a big portion of their time is wasted just doing these checks. More than half a billion vehicles are moving on the roads and these vehicles have license plates which helps differentiate between or identify each one of them[1]. Due to the enormous wave of vehicles it is evident that the human resources even in a small scale would not be sufficient to check all vehicles without the use of computers and signal processing techniques[1].

Though the applications of automatic license plate detection have emerged in the last decade or so, the technology has been present for nearly 45 years. In the late 1970s researchers for the United Kingdom's police scientific development branch manufactured the first working license plate recognition system and began deploying it by the beginning of the 1980s. The application areas for automatic license plate recognition include traffic monitoring, parking management, accident reporting, identifying drivers that cause traffic signal violations or drive in excess of the speed limit, for toll collection or to identify uninsured motorist.

Some other names for automatic license plate recognition include; automatic vehicle identification (AVI), car plate recognition (CPR), automatic number plate recognition (ANPR) and car plate reader (CPR). Vehicle license plates generally consist of a series of alpha numeric characters that reference the license plate to the specific vehicle registered (including the make, model, year, and vehicle identification number (VIN)) and the owner and/or lien holder of the vehicle. LPR systems can be used for vehicle identification, enforcement, collecting electronic tolls [2], traffic monitoring and travel management. In all these systems, the camera is fixed and is therefore only able to scan the vehicle passing through a particular point. On the other hand, mobile LPR systems have become a necessity for law enforcement especially with increasing volumes of vehicles being added to roads every year. The express penalty scheme app is also another system that is used by the Uganda traffic police to track down traffic offenders. It not only allows one to key in the registration number of a particular vehicle but also displays the necessary related information about the vehicle.

REFERENCES

- [1] S. Ghasempour, "Automatic License Plate Recognition (ALPR)," Eastern Mediterranean University, 2015.
- [2] D. W. Barowy, C. Curtsinger, E. D. Berger, and A. McGregor, "Automan: A platform for integrating human-based and digital computation," *Communications of the ACM*, vol. 59, no. 6, pp. 102-109, 2016.
- [3] D. J. Roberts and M. Casanova, "Automated license plate recognition systems: Policy and operational guidance for law enforcement," 2012.
- [4] B. Moharil, V. Ghadge, C. Gokhale, and P. Tambvekar, "An efficient approach for automatic number plate recognition system using quick response codes," *International Journal of Computer Science and Information Technology*, vol. 3, pp. 5108-5115, 2012.
- [5] V. Lajish and S. K. Koppurapu, "Mobile phone-based vehicle license plate recognition for road policing," *arXiv preprint arXiv:1504.01476*, 2015.
- [6] S. K. Koppurapu, "Mobile Phone Based Vehicle License Plate Recognition for Road Policing," *arXiv preprint arXiv:1504.01476*, 2015.
- [7] V. Abolghasemi and A. Ahmadyfard, "An edge-based color-aided method for license plate detection," *Image and Vision Computing*, vol. 27, no. 8, pp. 1134-1142, 2009.
- [8] C. Molder, M. Boscoianu, I. C. Vizitiu, and M. I. Stanciu, "Decision fusion for improved automatic license plate recognition," *WSEAS Transactions on Information Science and Applications*, vol. 6, no. 2, pp. 291-300, 2009.
- [9] R. Huang, H. Tawfik, and A. K. Nagar, "Licence plate character recognition based on support vector machines with clonal selection and fish swarm algorithms," in *Computer Modelling and Simulation, 2009. UKSIM'09. 11th International Conference on*, 2009, pp. 101-106: IEEE.
- [10] R. Huang, H. Tawfik, and A. Nagar, "Licence plate character recognition using artificial immune technique," in *International Conference on Computational Science*, 2008, pp. 823-832: Springer.
- [11] H. Xu and Z. Ma, "A practical design of gabor filter applied to licence plate character recognition," in *Computer Science and Information Technology, 2008. ICCSIT'08. International Conference on*, 2008, pp. 397-401: IEEE.
- [12] S. Paygude, R. Karadkar, P. Joshi, and D. Malhotra, "Be Positive—An Android Application for Blood Donation," *International Journal of Scientific Engineering and Technology (IJSET)*, vol. 5, no. 8, pp. 418-420, 2016.
- [13] A. Taherkordi and F. Eliassen, "Scalable modeling of cloud-based iot services for smart cities," in *Pervasive Computing and Communication Workshops (PerCom Workshops), 2016 IEEE International Conference on*, 2016, pp. 1-6: IEEE.
- [14] C. Sumathi, T. Santhanam, and G. G. Devi, "A survey on various approaches of text extraction in images," *International Journal of Computer Science and Engineering Survey*, vol. 3, no. 4, p. 27, 2012.
- [15] M.-C. Sung, B. Jun, H. Cho, and D. Kim, "Scene text detection with robust character candidate extraction method," in *Document Analysis and Recognition (ICDAR), 2015 13th International Conference on*, 2015, pp. 426-430: IEEE.
- [16] Y.-F. Pan, X. Hou, and C.-L. Liu, "A hybrid approach to detect and localize texts in natural scene images," *IEEE Transactions on Image Processing*, vol. 20, no. 3, pp. 800-813, 2011.

- [17] S. Kumar, R. Gupta, N. Khanna, S. Chaudhury, and S. D. Joshi, "Text extraction and document image segmentation using matched wavelets and MRF model," *IEEE Transactions on Image Processing*, vol. 16, no. 8, pp. 2117-2128, 2007.
- [18] S. K. Panchala and P. S. Umap, "SCENE TEXT RECOGNITION IN MOBILE APPLICATIONS BY CHARACTER DESCRIPTOR AND STRUCTURE CONFIGURATION."
- [19] C. D. Nguyen, M. Ardabilian, and L. Chen, "Robust car license plate localization using a novel texture descriptor," in *Advanced Video and Signal Based Surveillance, 2009. AVSS'09. Sixth IEEE International Conference on*, 2009, pp. 523-528: IEEE.
- [20] A. N. Bhute and B. Meshram, "Text Based Approach For Indexing And Retrieval Of Image And Video: A Review," *arXiv preprint arXiv:1404.1514*, 2014.
- [21] R. Dhir, "Video Text extraction and recognition: A survey," in *Wireless Communications, Signal Processing and Networking (WiSPNET), International Conference on*, 2016, pp. 1366-1373: IEEE.
- [22] H. El Bahi, Z. Mahani, and A. Zatni, "An enhancement text method for image acquired via digital cameras by PDE's stable model," in *Proc. of Proceedings of the 18th International Conference on Circuits, Santorini Island, Greece, 2014*, pp. 309-313.
- [23] H. K. Azad and K. Abhishek, "Semantic-synaptic web mining: A novel model for improving the web mining," in *Communication Systems and Network Technologies (CSNT), 2014 Fourth International Conference on*, 2014, pp. 454-457: IEEE.
- [24] A. Khatra, "Vehicle's RC Plate Tracking based on Image Processing Applications," *interfaces*, vol. 1, no. 4, 2013.
- [25] K. Kumar, K. Akhi, S. K. Gunti, and M. S. P. Reddy, "Implementing smart home using firebase," *International Journal of Research in Engineering and Applied Sciences*, vol. 6, no. 10, pp. 193-198, 2016.
- [26] N. Singh, "Study of Google Firebase API for Android," *International Journal of Innovative Research in Computer and Communication Engineering*, vol. 4, no. 9, pp. 16738-16743, 2016.
- [27] C.-H. Chuang, L.-W. Tsai, M.-S. Deng, J.-W. Hsieh, and K.-C. Fan, "Vehicle licence plate recognition using super-resolution technique," in *Advanced Video and Signal Based Surveillance (AVSS), 2014 11th IEEE International Conference on*, 2014, pp. 411-416: IEEE.
- [28] S. Du, M. Ibrahim, M. Shehata, and W. Badawy, "Automatic license plate recognition (ALPR): A state-of-the-art review," *IEEE Transactions on circuits and systems for video technology*, vol. 23, no. 2, pp. 311-325, 2013.
- [29] E. R. Buhus, D. Timis, and A. Apatean, "AUTOMATIC PARKING ACCESS USING OPENALPR ON RASPBERRY PI3," *Acta Technica Napocensis*, vol. 57, no. 3, p. 10, 2016.
- [30] V. Kozitsky, A. Burry, and C. Fillion, "Adaptive character segmentation method and system for automated license plate recognition," ed: Google Patents, 2015.