TCU Smart Parking: A Taguig City University Vehicle Parking Lot Organizer Through Plate Detection

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Abstract
The purpose of this project is to develop a new way/method in conducting a parking in the Taguig City University. For a more secure, more efficient, and easier way for both the operator of the system and the client. It lessens the illegal acts of criminals such as stealing a motorcycle. It also focused on determining the evaluation of the students, faculty members, and non teaching personnel on the developed TCU Smart Parking: A Taguig City University Vehicle Parking Lot Organizer Through Plate Detection using the criteria based on ISO 9126 software quality standard. A total of 60 students, 10 faculty staff, and 10 non-teaching personnel from Taguig City University participated in the study. To make the TCU Smart Parking: A Taguig City University Vehicle Parking Lot Organizer Through Plate Detection, the researchers used the Prototyping model, The design covers the model that is used to develop the application. The results of the evaluation of the proposed TCU Smart Parking: A Taguig City University Vehicle Parking Lot Organizer Through Plate Detection by the respondents was "Strongly Agree" . The result also shows that there are no significant differences between the evaluation of TCU Smart Parking: A Taguig City University Vehicle Parking Lot Organizer Through Plate Detection between students, faculty staff, and non-teaching personnel. Lastly, the improvements that the respondents suggested includes Security Features, Graphical User Interface, and Smarter Features.

I.   INTRODUCTION

Monitoring the parking lot in an area is very important. Not only it secures the vehicles that are parked there against theft, it also secures the buildings or structures behind it. Vehicle theft in Taguig City University parking lot is not uncommon and not having a system to monitor the area can be a big problem for the students and its employees. Vehicles can be stolen; Unmonitored visitors can come in and come out to the property without any trace so any illegal acts will be not caught. Even though we have surveillance cameras in the area to reduce the crimes, it is still not enough to avoid illegal acts such as vehicle theft. In order to secure the parking lot area and the structures behind it in a smart way, a system is needed to be implemented.

By creating a new system to monitor, organize and secure the TCU parking lot, it will be easier, more efficient, and more secure to conduct monitoring to the parking lot. The transparency and history of the vehicles that enter property is much easier than the current method as it is not yet digital and does not have a database. It will also be way harder for the criminal to do illegal acts such as stealing a vehicle especially motorcycle as it requires bypassing the security guard with the protocols of the new system that will be provided.

For many years now, TCU parking has relied on the traditional way of logging the vehicles during parking, it is writing the details of each vehicle on the book, the time, date and the details of the vehicle and the driver. Going through the information gathered can be hard as it is only written on the book. But by using the new system or method. You can now find the information through the database. As it is easier to find, track and monitor information. The protocols and the method of providing the service is also new and it is also easier, efficient, and

more secure. The operator of the system will scan the Plate Number of the client, it will automatically write the Plate Number to the system, it will also automatically write the date/time of the client's entry, the specific location into the parking lot, and the time/date of the exit of the client. The system will automatically provide the security code for the client after the Plate Number is scanned so that it can be used as a key to exit the parking lot. The operator of the system will then verify if it's the right code for the client to exit the parking lot. The code that is generated is unique, and it will be hard to duplicate or imitate so that the client will be the only one to know the key for the departure to the parking lot.

II.   LITERATURE REVIEW

Following a review of related literature and studies, the researcher discovered that there are similar studies to the current investigation both locally and internationally; however, despite the similar studies, the current study is still required to determine whether the findings of other studies in other locations are also true in the current study's locale. The literature and research that were obtained added to the study's value. In this way, they were linked: at first the literature and studies about smart parking can determine the way on how we the researcher will create the system; second the gathered information in the Related literature can be an important part in the development of the system; third the related literature helped the researcher on how to create techniques on gathering information and ideas; forth the related literatures give the researcher some insights on how can we know the limitation of the current study; last the review of related literature is very helpful reference for us to know how we can developed are own study and system. The related literature gathered is very useful tool for the researcher to know the differences between the current research and exciting research paper about the topic of smart parking. In some points our research topic has similarities and differences. For example: the scope of the study, target user or population and the scope of the area we will conduct and use the system.

III. RESEARCH METHODOLOGY

The researchers used descriptive and developmental methods of research in this study. The strategy increased the developed system's usability, functionality, effectiveness, and efficiency. The developmental method is used to assess changes over an extended period of time. The developmental method assesses the researchers in how to determine the differences between traditional parking vs. Smart parking. The descriptive method used to show the relationships between the existing practices that are being used and the developed system.

The researcher used the purposive sampling to define the target respondents for the evaluation of the system. The sample herein reflected the characteristics of the respondents from which they were picked. Its main advantage is that it is easy to understand and it is easy to apply too. The target respondents came from Taguig City University Students, Faculty and Utility Staff who are mainly using the parking space in the university. A total of 60 students, 10 faculty staff, and 10 non-teaching personnel from Taguig City University participated in the study.

The researchers used the standardized questionnaire based on (ISO/IEC 9126) for the evaluation of the proposed system.

IV. FINDING AND DISCUSSION

The findings of this research is based on the standardized questionnaire (ISO/IEC 9126)

**Evaluation of the respondents on the Proposed TCU Smart Parking: A Taguig City University Vehicle
Parking Lot Organizer Through Plate Detection**

Characteristics	Overall Means	Verbal Interpretation	Ranking
Functionality	4.33	Strongly Agree	3
Reliability	4.29	Strongly Agree	4
Usability	4.40	Strongly Agree	1
Efficiency	4.36	Strongly Agree	2
Maintainability	4.33	Strongly Agree	3
Portability	4.33	Strongly Agree	3
Total	4.34	Strongly Agree	

In this table, the overall result of evaluation in different categories shows that all 80 respondents viewed
our Application TCU SMART PARKING as **"Strongly Agree"** which has a total rating of **4.34** in terms of different
characteristics that our application has, such as Functionality, Reliability, Usability, Efficiency, Maintainability,
and Portability.

It was revealed that the overall means of the **"Functionality"** gathered a rating of **4.33** which interpreted
as Strongly agree

The highest rating that is gathered is the **"Usability"** characteristics which gathered a rating of **4.40**
which also interpreted as Strongly Agree, while the lowest rating that's gathered by the researcher to the
respondents is on the characteristic of **"Reliability"** which has a **4.29** Overall means.

V. CONCLUSION AND FURTHER RESEARCH

Based on the findings, the researcher came up with the following conclusions:
1. The new developed system is a very effective way to monitor/organize the parking lot of the Taguig City
   University.
2. The newly developed system is very secure and at the same time very efficient when it comes to storing, showing
   and even finding information of specific vehicles that enter the Taguig City University premises.
3. The new developed system is also innovative in terms of conducting or monitoring the Taguig City University's
   parking lot in a new or unique way.
4. The newly developed system is easy to understand and easy to operate.
5. The newly developed system is very accurate in terms of displaying data or information about the current status
   of the parking lot, vehicles that are parked, information of the registered vehicle within the application.

Recommendations

Based on the results of the findings and conclusions, the researcher would like to recommend the following:

1. The researcher recommends that the format of the plate numbers that the system can recognize should be added as the Philippine's plate number format has a lot of variety.
2. Using a clean and neat font for the plate numbers will be ideal as sometimes it can recognize other characters like for example O as 0 and etc.
3. The user interface of the system should not be dark as it will not be very pleasing to the eyes of the operator.
4. The security of the vehicle that is registered should always be the number one priority as it contains very important information.
5. Use a trusted database that the data cannot be leaked to others as it can be used for any illegal actions or criminal acts.
6. The researchers suggest that the camera of the phone that the system will be installed in should be good to have a good result especially for a low light environment.

REFERENCES

1. 2018 International Conference on Electronics, Information, and Communication (ICEIC).
2. Ramasamy, M., Solanki, S. G., Natarajan, E., & Keat, T. M. (2018).
3. 2019 8th Asia-Pacific Conference on Antennas and Propagation (APCAP).
4. Ibrahim, Mr S. Jafar Ali, K. Singaraj, P. Jebaroopan, and S. A. Sheikfareed. "Android Based Robot for Industrial Application." International Journal of Engineering Research & Technology 3, no. 3 (2014).
5. Jeyaselvi, M., M. Sathya, S. Suchitra, S. Jafar Ali Ibrahim, and N. S. Kalyan Chakravarthy. "SVM-Based Cloning and Jamming Attack Detection in IoT Sensor Networks." Advances in Information Communication Technology and Computing, pp. 461-471. Springer, Singapore, 2022.
6. Ibrahim, Jafar Ali S., S. Rajasekar, Varsha, M. Karunakaran, K. Kasirajan, Kalyan NS Chakravarthy, V. Kumar, and K. J. Kaur. "Recent advances in performance and effect of Zr doping with ZnO thin film sensor in ammonia vapour sensing." GLOBAL NEST JOURNAL 23, no. 4 (2021): 526-531.
7. Elayaraja, D, Ibrahim, S. Jafar Ali. "Design Parametric Optimization Of Wall Following Robot." Turkish Journal of Computer and Mathematics Education (TURCOMAT) 12, no. 8 (2021): 2072-2080.
8. Malik, K. Alhaf, D. Elayaraja, S. Jafar Ali Ibrahim, and NS Kalyan Chakravarthy. "INVESTIGATING THE POTENTIAL CONSEQUENCES OF THE MEMBERSHIP FUNCTIONS IN A FUZZY LOGIC CONTROLLER-BASED OBSTACLE CLIMBING ROBOT." INFORMATION TECHNOLOGY IN INDUSTRY 9, no. 1 (2021): 1294-1299.
9. Anggawijaya, Y. M., Weng, T.-H., & Herawati, R. (2019)
10. Chen, R., Hu, X., & Mu, W. (2020)
11. Dong, S., Chen, M., Peng, L., & Li, H. (2018).
12. Gonzalez-Martinez, L. R., Cerdan, M. A., & Sanchez-Garcia, A. J. (2020).
13. Hainalkar, G. N., & Vanjale, M. S. (2017).
14. Hassija, V., Saxena, V., Chamola, V., & Yu, R. (2020).
15. Hu, F. Y., Wang, B. R., & Zhang, H. X. (2021).
16. Jioudi, B., Dachry, W., Moutaouakkil, F., & Medromi, H. (2018).
17. Kanteti, D., Srikar, D. V. S., & Ramesh, T. K. (2018)
18. Kocsany, L., Adam, A. B., & Szadeczky-Kardoss, E. G. (2020).
19. Ning, S., Zhong, J., & Zheng, X. (2021).
20. Parise, G., Parise, L., Allegri, M., Mazzaro, M., Pennacchia, R., Regoli, F., & Marra, V. (2021).
21. ParkingRank-D: A Spatial-temporal Ranking Model of Urban Parking Lots in City-wide Parking Guidance SystemCity-wide parking guidance systems (CPGS)
22. Shih, S.-E., & Tsai, W.-H. (2017).
23. Sieck, N., Calpin, C., & Almalag, M. (2020).
24. Somani, A., Periwal, S., Patel, K., & Gaikwad, P. (2018).
25. Sonntag, J., & Schmidt-Thieme, L. (2020).