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Development of Fingerprint Engine Starter

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Abstract

There had been numbers of researches that worked on biometrics. This study was focused on biometric application for motorbikes and scooters.

There are lot of motorbikes that we encountered every day, and carjacking and car napping is everywhere. This study was then conducted in order to apply more security and avoid unauthorized use of the motorbike.

The primary purpose of this study is to explore the development of an electric engine starter into a fingerprint-based engine starter to upgrade and develop higher security in a vehicle especially on motorbikes and scooters that are widely used by students of the Batangas State University ARASOF Nasugbu. The research study focuses in the design and adaptability of the fingerprint engine starter to provide a security for motorbikes and scooters.

The researchers summed up the whole study and concluded that there was a significant difference between the existing Electric Engine Starter System and the Fingerprint Engine Starter for Motorbikes and Scooters. The evaluated Fingerprint Engine Starter for Motorbikes and Scooters offers more security compared to the existing Electric Engine Starting System.

Keywords: Motorbike, Fingerprint Scanner, Registration

Introduction

As time passing by, everything is evolving and improving. History tells us what our ancestors have and we can observe what we have today. There are lot of differences and improvements, and there are still more room for improvements. The transportation evolution comes from riding a horse to the invention of chariots. Next is the push cart, followed by invention of engine and mounted it to the cart. By then, it was called car. The early people started the engine of their car by using crank wrench. It was followed by the birth of electric engine starter. It has the same concept that motorcycles have, which is using kick starter to start the engine. Motorcycles adopt the electric starter used by cars.

With the help of technology, many things were discovered. Man is not yet contented to what he has, continually discovering and inventing things that give assurance and security in life. Securing personal properties is natural to human. There are lots of things that use high security system.

In the 21st century, the uses of biometric based systems have seen an exponential growth. This is all because of tremendous progress in this field making it possible to bring down their prices, easiness of use and its diversified use in everyday life. Biometrics is becoming new state of art method of security systems. Biometrics are used to prevent unauthorized access to ATM, cellular phones , laptops , offices, cars and many other security concerned things. Biometric have brought significant changes in security systems making them more secure than before, efficient and cheap. They have changed the security system from something to remember (such as password) or what you always bring (such as car keys) to biometrics (retinal patterns, fingerprints, voice recognition).

Biometrics is the science and technology of measuring and analyzing biological data. In information technology, biometrics refers to technologies that measure and analyzes human body characteristics, such as DNA, fingerprints, eye retinas and irises, voice patterns, facial patterns and hand measurements, for authentication purposes.

The Fingerprint Engine Starter Device starts engine by recognizing the biometric information of the driver. It can be applied not only to car but to all engine systems including motorbikes and scooters. Engine start is possible only when it recognizes stored fingerprint. If other fingerprint is unrecognized, it prevents engine to start.

Objective

The Fingerprint Engine Starter for Motorbikes and Scooters is focused in more stylish and more secure engine starting for motorbikes and scooters that have electric engine starter. It limits the number of users that makes the motorbikes and scooters more secure. The motorbike or scooter installed with this device needs to recognize the user before it start its engine.

The study was aimed to improve the security of the motorcycles and scooters. It was also aimed to create a newer and better starting system for motorbikes and scooters.

Specifically, this study sought to evaluate the current electric engine starter system and the developed fingerprint engine starter system in terms of accuracy, efficiency, security, reliability, user-friendliness and determine the significant difference of the level of acceptability of the two systems in terms of mentioned criteria.

Literature Cited

Fingerprints have been scientifically studied for many years in our society. The characteristics of fingerprints were studied as early as 1600s. Meanwhile, using fingerprints as a means of identification first occurred in the mid-1800s.

With a growing database of fingerprint images, it soon became desirable to have an efficient manner of classifying the various images. Between 1896 and 1897, Sir Edward Henry developed the Henry Classification System, which quickly found worldwide acceptance within a few years. This system allows for logical categorization of a complete set of the ten fingerprint images for a person. Until the mid-1990s, many organizations continued to use the Henry Classification System to store their physical files of fingerprint images (Diefenderfer, 2006).

As fingerprints began to be utilized in more fields, the number of requests for fingerprint matching began to increase on a daily basis. At the same time, the size of the databases continued to expand with each passing day. In the early 1960s, the FBI, Home Office in the United Kingdom, and Paris Police Department began to devote a large amount of resources in developing automatic fingerprint identification systems. Today, automatic fingerprint recognition technology can be found in a wide range of civilian applications (Government, 2011)

It's becoming common place to see fingerprint scanners included in various devices and the recent addition of them in automobiles comes as no surprise. These scanners in cars are added as safety features, where the car owner does not need the car keys to open the doors or start the engine. This is made to be an auto theft deterrent as the thief would not be able to start the vehicle without taking the time to hotwire the car and that would be time consuming. Car fingerprint scanners are used in two different ways, one in which the scanner is embedded inside the dashboard and the other is done remotely, where the owner will have a wireless scanning device that they can use to remotely start the engine before they get inside the car (James, 2011).

By combining the unique identifying process of fingerprint ID with an onboard computer, Siemens believe it would be easy to activate personal settings for the vehicle. The system would simply determine who you were and adjust seating, mirror positions, climate, stereo and other devices to the user's personal preferences. Fingertip sensors – produced from the same Complementary Metal Oxide

Semiconductor (CMOS) technology used for conventional memory chips – is just one of many technologies Siemens are currently developing. They stress that their high level of investment in research and development is key to their ability to bring such technologies to production (Global News).

In large government organizations and corporations, biometrics plays a huge role in employee identification and security. Additionally some data centers have jumped on the bandwagon and have implemented biometric scanners to enhance remote access and management by adding another layer of network security for system administrators. Unfortunately the cost of implementing fingerprint and other biometric security scanning in data centers is still quite expensive, and many centers still rely on ID badges while waiting until biometric technology becomes a little more pocket-book friendly (Zerowire.in).

Methods

> "The ultimate measure of a man is not where he stands in moments of comfort, but where he stands at times of challenge and controversy." - Martin Luther King Jr.

The researchers use the prototyping model as guide in the development of the project.

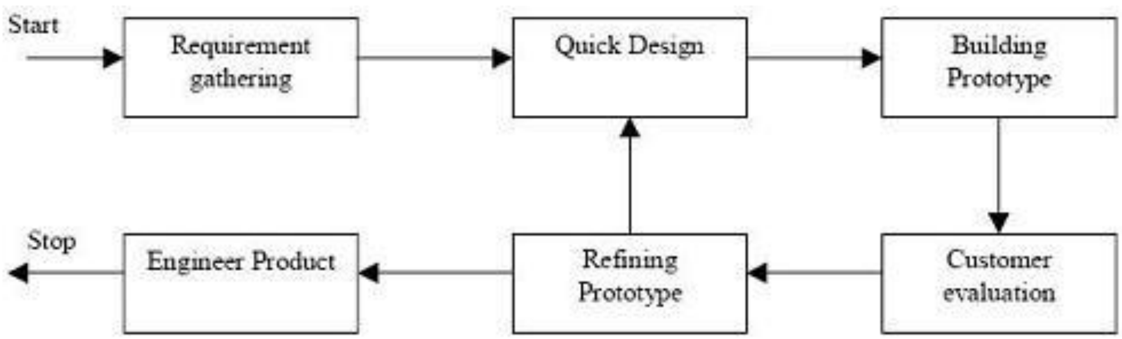

Figure 1 shows the model used by the researchers in achieving the project goal. There are six (6) stages and the iteration happens from the quick design to refining prototype when the customer evaluation resulted to disapproval of the prototype. Once the approved and satisfied, the process will proceed to the end stage which is the production of the product.

Results and Discussions

The actual testing was performed to assure that the Fingerprint Starter meets the needed output and to know the quality of the device. It also provides goals to know the implementation risk of the design project. In order to meet the expectation and to achieve the project goals, the proponents tested it several times and shows to all respondents how it works.

The College students of BatStateU ARASOF Nasugbu were the target respondents of the project. The sample size of the respondents was obtained by the Slovin's formula: n = N/(1+Ne2) wherein n is the sample size, N is the total population of College Students in the campus and e is the margin of error (Adanza, 2006, p. 81)

Applying the formula, the number of respondents is:

$$n = N/ (1 + Ne^2)$$

$$n = 3292/ [1 + 3292(0.05)^2]$$

$$n = 3292/ (1 + 8.23)$$

$$n = 3292/9.23$$

$$n = 356.667 = 357 \text{ respondents}$$

The researchers used validated questionnaires to acquire the needed evaluation of the respondents. Likert scale-type questionnaire was adopted: 5- Excellent, 4- Very Good, 3- Good, 2-Fair, and 1- Poor.

The researchers get the interval of the said scale using the formula:

$$i = (h – l)/t$$

where i is the interval, h is the highest value in the evaluation form, l is the lowest value in the evaluation form of acceptability, and t is the total number of options in the evaluation form to determine the interval between rankings in the questionnaires evaluation criteria. (Pacho et al. 9)

Table 1
Guidelines Interval for Evaluation and Interpretation

Scale	**Mean Range**	**Verbal Interpretation**
5	4.21 – 5.00	Excellent
4	3.41 – 4.20	Very Good
3	2.61 – 3.40	Good
2	1.81 – 2.60	Fair
1	1.00 – 1.80	Poor

Tables 1 represent the guidelines interval in determining the statistics of the level of acceptability of the systems.

In computing the weighted mean, the proponent used the formula:

$$WM = \frac{\sum f(v)=f_1v_1+f_2v_2+f_3v_3.....+f_nv_n}{S_s}$$

where, WM is the weighted mean, f is the frequency, v is the value of the scale, $S_s$is the sample size.(Altares et al. 68)

For the percentage distribution, the percentage formula was used where % is the percentage, f is the number of respondents who select the particular option, and n is the total number of respondents.

Table 2
Assessment of the Electric Engine Staring System

	Ratings					Weighted Mean	Remarks
	5	4	3	2	1		
Accuracy	18	55	131	87	66	2.64	Good
Efficiency	22	63	115	87	70	2.66	Good
Security	36	38	106	95	82	2.58	Fair
Reliability	16	54	111	85	91	2.49	Fair
User-Friendliness	24	52	103	83	94	2.51	Fair
Average Weighted Mean						2.58	Fair

Table 2 presents the frequency distribution of the evaluation of the existing Electric Engine Starter. It also presents the result of the computation of ratings of the respondents according to their scale value in terms of accuracy, efficiency, security, reliability, and user-friendliness.

Table 3
Percentage Distribution of the evaluation of the Existing Electric Engine Staring System

	Rating					Total
	5	4	3	2	1	
Accuracy	5.04%	15.41%	36.39%	24.37%	18.49%	100%
Efficiency	6.16%	17.65%	32.21%	24.37%	19.61%	100%
Security	10.08%	10.64%	29.69%	26.62%	22.97%	100%
Reliability	4.48%	15.13%	31.09%	23.81%	25.50%	100%
User-Friendliness	06.67%	14.56%	28.85%	23.24%	26.33%	100%

Table 3 presents the percentage distribution on the evaluation of existing Electric Engine Staring System.

Table 4
Assessment of the Developed Fingerprint Engine Starter

	Ratings					Weighted Mean	Remarks
	5	4	3	2	1		
Accuracy	180	108	53	12	4	4.25	Excellent
Efficiency	181	110	50	14	2	4.27	Excellent
Security	208	82	51	11	5	4.37	Excellent
Reliability	195	95	51	7	9	4.28	Excellent
User-Friendliness	199	84	48	10	16	4.23	Excellent
Average Weighted Mean						4.28	Excellent

Table 4 presents the frequency distribution of the evaluation of the proposed Fingerprint Engine Starter. It also presents the result of the computation of ratings of the respondents according to their scale value in terms of accuracy, efficiency, security, reliability, and user-friendliness.

Table 5
Percentage Distribution of the Evaluation of the Developed Fingerprint Engine Starter

	Rating					Total
	5	4	3	2	1	
Accuracy	50.42%	30.25%	14.85%	3.36%	1.12%	100%
Efficiency	50.70%	30.81%	14.01%	3.92%	0.56%	100%
Security	58.26%	22.97%	14.29%	3.08%	1.40%	100%
Reliability	54.62%	26.61%	14.28%	0.19%	0.25%	100%
User-Friendliness	55.74%	23.53%	14.28%	0.28%	0.45%	100%

Table 5 presents the percentage distribution of the evaluation of the Proposed Fingerprint Engine Starter. It is evident that in all criteria, the project got a higher rating.

Table 6
The computation of Pearson's Product-Moment coefficient of correlation of the existing Electric Engine Starter and Fingerprint Engine Starter Assessment

Criteria	**X (Existing)**	**Y (Proposed)**	**xy**	**x^2 (Existing)**	**y^2 (Proposed)**
Accuracy	2.64	4.25	11.22	6.97	18.06
Efficiency	2.66	4.27	11.36	7.08	18.23
Security	2.58	4.37	11.27	6.66	19.10
Reliability	2.49	4.28	10.66	6.20	18.32
User-friendliness	2.51	4.23	10.62	6.30	17.90
	$\sum x=12.88$	$\sum y=21.40$	$\sum xy=55.13$	$\sum x^2=33.21$	$\sum y^2=91.61$

Table 6 shows the computation of Pearson's Product-Moment Coefficient of Correlation of the existing Electric Engine Starter and the developed Fingerprint Engine Starter.

Computing the Pearson r, the researchers used the formula

$$r = \frac{N\Sigma XY - \Sigma X\Sigma Y}{\sqrt{[N\Sigma X^2 - (\Sigma X)^2][N\Sigma Y^2 - (\Sigma Y)^2]}}$$

where X = the observed data for the independent variable
y = the observed data for the dependent variable
N = sample size
r = degree of relationship between x and y

(Altares, Et. Al, 2003)

r = 0.99

Table 7
The Quantitative Interpretation of the Degree of Linear Relationship (Altares, 2005)

Value of r	Interpretation
±1.00	Perfect Positive (Negative) Correlation
±0.91 - ±0.99	Very High Positive (Negative) Correlation
±0.71 - ±0.90	High Positive (Negative) Correlation
±0.51 - ±0.70	Moderately Positive (Negative) Correlation
±0.31 - ±0.50	Low Positive (Negative) Correlation
±0.01 - ±0.30	Negligible Positive (Negative) Correlation
0.00	No Correlation

Table 7 shows the quantitative interpretation of the degree of linear relationship for the value of r.

As the researchers compare the value of r in the table of quantitative interpretation of r, the existing Electric Engine Starter System and the developed Fingerprint Engine Starter are having a very high positive correlation.

The researchers used hypothesis testing to determine whether the hypothesis is accepted or rejected based on a sample evidence of probability theory.

The test for significance of r is needed in order to know whether the computed r is significant or not. The computed r is 0.99.

The formulated null and alternative hypotheses were Ho: P = O, where there is no relation between the existing and developed project. Ha: P = O, where there is a relationship between the existing and developed project. The level of significance is $\alpha = 0.05$.

The proponents used the formula for df = n-2 where n is the number of sample size or criteria (Altares, Et. Al, 2003).

$$df = n - 2$$
$$= 5 - 2$$
$$df = 3$$

Computing the Test Statistics, the proponents used the formula (Altares, Et. Al, 2003)

$$t = r\sqrt{\frac{n-2}{1-r^2}}$$

$$t = 18.57$$

Table 8
Table of Critical Values for t (Sirkin, 2006)

	Two Tailed Significance				
df	**0.2**	**0.1**	**0.05**	**0.01**	**0.001**
2	1.89	2.92	4.30	9.92	31.60
3	1.64	2.35	3.18	5.84	12.92
4	1.53	2.13	2.78	4.60	8.61
5	1.48	2.02	2.57	4.03	6.87
6	1.44	1.94	2.45	3.71	5.96
7	1.41	1.89	2.36	3.50	5.41
8	1.40	1.86	2.31	3.36	5.04
9	1.38	1.83	2.26	3.25	4.78
10	1.37	1.81	2.23	3.17	4.59

Table 8, it provides the table of critical values of t.

Based on the table of the critical values of t, t = 3.18. Since the result of computing t is 18.57 is greater than 3.18 from table 8, having a df of 3 with .05 level of significance, reject the Ho and accept Ha.

After developing and evaluating the developed Fingerprint Engine Starter, the study came up with the following findings:

1. The existing Electric Engine Starter was evaluated by the respondents and with an over-all rating as Fair.
2. The developed Fingerprint Engine Starter was evaluated and got an over-all rating as Excellent.
3. There's a significant difference between the existing system and the developed design project since the absolute value of the computed t= 18.57 using the value of r derived from the value of the total weighted mean of existing and developed system is greater than the critical value t= 2.36.

CONCLUSIONS

The researchers have several conclusions and observations during the development of the Fingerprint Engine Starter among which are the following:

1. The existing Electric Engine Starter still has more rooms for improvement.
2. The developed Fingerprint Engine Starter is a better alternative to the existing Electric Engine Starter.
3. There is significant difference in the over-all acceptance of the respondents of the existing starter system and the developed starter system.

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