

Fuel Consumption Cost Estimator (FCCE)

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Abstract: This research focus on the software that called Fuel Consumption Cost Estimator (FCCE) that will give a total estimation for fuel consumption. FCCE is an automated system that will calculates the total amount of fuel cost for a car to travel based on the distance given to get to the destination. The calculation is based on Parametric Estimating method. By using this system, the user will get a summary which based on the user's data and will give the best solution to estimate the minimum cost towards the desired destination. FCCE has been successfully developed and tested in the single client server environment.

Key words: Automated system, FCCE, fuel estimation, software

INTRODUCTION

Nowadays, we all notice that the price of fuel is getting expensive from time to time. There have been at least 5 times of rising fuel cost in Malaysia since, year 2000. This has been a burden to an average-to-low income family in Malaysia. Even though the government has stood up in helping citizens by giving certain amount of money per vehicle owner to reduce their burden, but the solution of reducing the total amount of fuel cost and consumption seems to be more helpful to the citizens of Malaysia.

Therefore, the steps to reduce the fuel consumption are absolutely important to save our money towards unnecessary spend. This system will do a calculation based on the data that user input and provide a result on fuel used to reach to the destination. To assist in the process, the utilization of information technology and automated software can provide efficiency and effective solutions to the problems of mass data and information handling (Moody, 1998; Connolly and Begg, 2005). Object-oriented software engineering methodology the idea object model for the business relates to the use case model of the supporting information system (Moody, 1998). In particular, estimating methods represent important processes for calculation total fuel consumption cost Slater (1997).

The system will also make a comparison from several results to produce the best result to the user by using mathematical based estimating methods. The user will observe the conclusion and will take the best result as

their guide to reduce the fuel consumption and also their money in everyday life.

Before the existing of estimation system, the citizens tend to spend their money towards fuel without specific planning. The benefits of saving from estimating fuel consumption are largely seems to take effect when a driver make a plan towards their fuel consumption after few months or years of driving. At glance, they can save up little extra money to spend to other things rather than wasting it unnecessary towards fuel.

Fuel Consumption Cost Estimator comes with database technology that capable to save and retrieve data of driver's information. The software design consists modules of the driver's account, factors of affecting fuel consumption, process for estimation, total time consume and summary from driver's data. Briefly, Visual Basic. Net language and SQL Server were used to develop the Fuel Consumption Estimation and its database system, respectively.

Concepts of the system: Modern large-scale industrial development is based on fossil fuel use, which has largely supplanted water-driven mills, as well as the combustion of wood or peat for heat.

Consumption: In economics consumption is primary motivating force in the wealth or utility maximizing paradigm. Consumers choose the group of goods and services that make them happiest. All activities are directed towards consumption, either of traditional goods and services, or of personal and perhaps unique activities

(Lin and Hong, 2008). With the advent of exchange, consumption is altered by the ability of individuals to take advantage of the gains from trade to adjust their consumption activities with others in the economy (Kay, 1993).

Estimator: Many different estimators are possible for any given parameter. Some criterion is used to choose between the estimators, although, it is often the case that a criterion cannot be used to clearly pick one estimator over another (Mc Mornies, 2004).

Data management: Organizations today operate in a highly global, fast-paced and competitive environment. One of the key resources they need to perform their tasks effectively and efficiently is data management. We can consider a database as a collection of related data and the Database Management System (DBMS) as the software that manages and controls access to the database.

MATERIALS AND METHODS

FCCE uses waterfall model as a software process model to represent the different stages in software development (Lin and Hong, 2008). It applies 3 fact-finding techniques in gathering functional requirements. These techniques are interviewing mechanics to get fuel consumption factors, questionnaires from experienced long-distance drivers and test-run on certain destination.

System overview: This system is designed for all car drivers especially for low and average income families to reduce the fuel usage consumption in their everyday life. This system will analyze and make a conclusion based on the speed of the car, the engine power (cc) of the car and the distance that had been set. This system will do the calculation and do a searching of the shortest and best path that had been set and will show the amount of fuel had been used to reach a certain destination in litres. Next, the system will convert the amount of fuel usage and calculate the exact price in Ringgit Malaysia (RM) according to the latest fuel price in the market. The best time to get to the destination will also provided by this system as well as the details on each calculation of route taken to get to the preferred destination. Users also can modify their factors such as driving speed, weight capacity and others to get the best results towards that destination.

Logical design: Logical database model is on logic, which is a readable method and useful for representing the knowledge. The concept database management system is applied in fuel consumption cost estimator is for data

Table 1: FCCE data dictionary

Field	Type	Null	Default
Userid	Int	No	Inc by 1
Username	Varchar	No	
Password	Int	No	
Cpassword	Int	No	
Emailadd	Varchar	No	
Firstname	Varchar	No	
Last name	Varchar	No	
Carmodel	Varchar	No	
Enginecc	Varchar	No	
Transtype	Varchar	No	
Carplate	Varchar	No	
Address	Varchar	No	



Fig. 1: The main page for FCCE

accessibility. For example, frequent users of FCCE that register more than 1 vehicle may only enter their car plate number to retrieve the vehicle's data such as engine cc and vehicle model and etc. A database management system allows an organization to structure its information so those users can retrieve data in a flexible manner as well as to prevent users against unauthorized access.

From the research, we know the inputs that needed for the system development have related with particular entity. Files and processes involve in company operation is specified by using Data Flow Diagrams and Data Dictionary. FCCE is examined at the top level, ignoring any dependencies that may exist in the system objects (Table 1).

Non-functional requirements define constraints imposed on the development and implementation of the system in the approach of building quality into the system. FCCE were integrated with software quality attributes such as stable and reliable, maintainable and extensible and accessible only by authorized users.

Fuel consumption cost calculation: Fuel consumption cost calculation is based on several factors such as vehicle's engine cc, transmission type, driving style, average speed on road, passenger and luggage weight capacity, air conditional status, vehicle service and distance covered. The system will calculate by converting each of the factors into a certain value and calculate it to produce an estimation of fuel consumed. The amount of fuel consumed will multiply by the current fuel price in

Fig. 2: Interface for data calculation

Malaysia so that the exact amount of price needed to spend to reach towards the destination can be stated.

Interface design: The user needs to register before they can login into the system (Fig. 1). The purpose of registration is to store the driver and its vehicle's details into the system for an easier use for the system to calculate (Fig. 2).

IMPLEMENTATION AND TESTING

At system implementation stage, a functional system is coded and tested to ensure the system fulfills business and design requirements. For example, to verify that the data that calculated by the system is accurate, a real-life running scenario were tested. The results from the system and real-life test must be at least within the accepted margin of results.

User details modules: User details modules are used to keep all data from user that will use the system. Data such as driver's username, password, full name, address, driving style, vehicle's information, engine cc, were all kept in database. This module is used by the system to retrieve all the existing data and calculate it straightly so that user can save some time instead of enter the same data repeatedly (Fig. 3).

Fuel consumption calculator system: Fuel consumption Calculator System module is to create an engine to provide an estimation of fuel consumed. The methods used are one of the mathematical estimations that called Parametric Estimating methods. Statistical analysis is performed on the data to find correlations between cost drivers and other system parameters, such as design or performance parameters. The analysis produces cost equations or cost estimating relationships that can be used individually or grouped into more complex models. This technique is useful when the information available is not very detailed.

Fig. 3: Interface of FCCE for User details module

Summary	
Driving speed	: 110 km h ⁻¹
Estimate time taken	: 5.11 h
Fuel consumed	: 29.29 L
Fuel cost	: RM 79.101

Fig. 4: Interface of FCCE for results and summary

RESULTS

As mentioned before, FCCE is developed using software Visual Basic. Net 2005 and SQL Server 2000 as its database. The system was fully implemented in VB language with SQL codes to manipulate the data.

FCCE has been successfully developed and tested in the single client server environment (Fig. 4). The system is capable of:

- Saving the driver's and its vehicle information.
- Retrieve the driver's and its vehicle information.
- Converting the fuel consumption factors into a certain value.
- Calculating the total amount of fuel consumed to reach a certain destination.
- Summarize and give several options to reduce the fuel cost towards the destination.

CONCLUSION AND FUTURE RESEARCH

FCCE has at the very least help the low to average income families to save up little more money in their everyday spending. By using FCCE, the car drivers not only can cut cost but also can manage better time to estimates the arrival time towards the destination.

Currently, we are working on adding extra function towards the system such as exact estimation upon departure and arrival time, annual fuel consumption saver and several other factors that affecting fuel consumption while driving.

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