Automated Garbage Collection Alert System

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Abstract— *Waste collection has become one of the major issue in today's world. In a country like Sri Lanka there are no proper facilities for final disposal produced by households and industries. And also, relevant authorities do not pay much attention to this matter. There are different types of waste collection and management methods all around the world. But in Sri Lanka there is no proper computer based waste collection system has been developed yet. In this study a methodology for the optimization of the waste collection and transport system, based on Geographic Information System (GIS) was developed in this system, we introduce a mobile application to manage garbage in various areas. Through this mobile application, we can direct connect to the Municipal Council and inform the exact location of the garbage dump. In this system, we mainly focus on garbage dumps in the streets and main roads. By using this mobile application both people and municipal council can save time and extra money that they spend to collect waste in country like Sri Lanka.*

Keywords— **GIS, Solid waste disposal, Location tracking**

I. INTRODUCTION

With the increase in population garbage has become one of the major problem in a country like Sri Lanka. There are no proper way to disposal the garbage in our country. So people used to put garbage beside the roads. Daily life in countries like Sri Lanka can generate several kilograms of solid waste from houses, factories, companies and various places. And with the development of Sri Lanka people are moving to cities for their own benefits, so that the amount of garbage increasing day by day. Because of these reasons garbage problem has become a huge problem for people.

There are different types of waste collection and management methods all around the world. But in Sri Lanka there is no proper computer based waste collection system has been developed yet.

So in this project we decided to implement a mobile application to develop a computer based garbage collection system. Using Information & communication technology this problem can solve successfully and also improve the environment friendliness.

By using this "CleanUp" mobile application anyone can inform the locations of garbage dumps. Anyone can this mobile application from anywhere by typing their name and their mobile number. And then he/she can track the garbage location and send it to the nearest municipal council. Then user will get a confirm message whether the tracked location and other information's (date and time, username, user mobile number) are send or not to the municipal council.

A. Objectives

With the aim of developing an Automated Garbage Collection Alert System, we have identified the following objectives.

- To critically study the current issues in garbage collection in Sri Lanka
- To critically study the existing computer based solution for garbage collection
- To do a study software engineering life cycle
- To conduct a detailed study on current mobile applications, database and web technologies
- To develop a prototype for the system
- Design and develop Automated Garbage Collection Alert System
- Evaluate the new Automated Garbage Collection Alert System

B. Hypothesis

One of the major issue that we are facing today is garbage collection. The methods that we are using to collect garbage today in Sri Lanka is not effective. And there is no proper Information Communication and Technology (ICT) based system to solve this matter. Technology has become a very important thing to our day today life and it is beginning to reshape our standard way of living. Internet is one of the information resources that today people are used. People save a lot of time and cash and find the information by giving little effort within the comfort of the home. In near future Information and Communication technologies (ICTs) will apply directly to urban problems to enable safer, healthier cities. The hypothesis for the creating CleanApp mobile application is to develop a computer based garbage collection system. In this system we mainly focus on to remove the the garbage that collect beside roads. Using Information & communication technology this problem can solve successfully and also improve the environment friendliness.

C. *Software solution for Garbage Collection Alert System*

The solution of the Garbage collection alert system it is necessary to use new technological methodology for the system. According to that requirement system has developed by using C# and using SQL database to run on windows operating system. The mobile application has developed by using Java and Android studio.

D. *Resource Requirements*

- The mobile application would develop as it is compatible with any other mobile phones which runs android, IOS and windows.
- The web server will be developed as it is compatible with any computer which runs Windows 7, Windows 8.1 and Windows 10.
- The mobile application will be implement by using Java and the android studio.
- The administrative interface will be developing by using the C# language with ASP.net framework.
- The database will be implement by using db forge studio for SQL server

II. LITERATURE REVIEW

Through the review, it will be thought about regarding the procedure and available practices in automated garbage collection

[1] Jose M. Gutierrez et al (2015) has presented a waste collection solution based on providing intelligence to trashcans, by using an IOT prototype embedded with sensors, which can read, collect, and transmit trash volume data over the Internet. They have described how an integrated cyber physical system design, based on the combination of different disciplines in engineering, and taking advantage of municipal wireless access networks can lead to smart ways of improving the management of cities

[2] Adebayo P. Idowu et al. (2012) has developed a web based GIS waste disposal management system with the aim of achieving an effective waste management system and a spatial view of waste collection locations in any local government are in Nigeria. With this waste management system, the location of all the waste collection tanks in any location will be, monitored, managed and maintained. The use of this system will ease the job of the waste management unit of the local government areas in Nigeria in achieving a clean environment and mitigate the spread of epidemic in a way to ensure safety of all and sundry.

[3] Ashish Sam Geo, et al., have developed a new approach for a systematic development in managing solid waste. Garbage location is identified by using the GPS device installed and the coordinates are send to the corresponding mobile with GPRS module.

In this system, they have focused on to develop an electronic monitoring system for solid waste management. The system will have the facility to send SMS to the workers and supervisors. To develop a web based GUI so that the system can be accessed from anywhere and information can be viewed by different group of people.

III. METHODOLOGY AND EXPERIMENTAL DESIGN

A. *Approach*

In the Garbage collection alert system process first user should login to the Mobile application by providing user's name and phone number to the system. Then the mobile application will track the coordinates (longitude and latitude) of the location where user is in (where the garbage dump is located). Then those information; User name, User mobile Number, Date and time and coordinates of the tracked garbage dump will send to the web server that is located in Municipal Council. After taking the information from the mobile application those details will be displayed on the municipal council's web server. The location of the garbage will be display on a map according to the coordinates that sent from the mobile application. Then the assign people will be send to that particular places to collect that garbage. And the web application will send a notification for the user whether the information send successfully or not and give a compliment for the sender for his service Each information that users send will stores in SQL server database successfully and for the work with the application it required continuous internet connection.

B. *Technology Adopted*

It is very important to use acceptable tools so as to develop productive system. Use on any inappropriate tools can solely ends up in develop a system with unnecessary errors and faults and use of those badly chosen technologies additionally can ends up in crashed when the new system implementation. Badly chosen technologies which can be extremely advanced and complicated will enable manufacturing a system with a top quality, however these technologies may result in develop a system that spend lots of time and resources so as to

perform a task that is anticipated by the system. It is very important to use applicable programming language and the other necessary tools in order to develop a productive system. Therefore, these technologies and tools can help to develop the system among a minimum development time the most objective of developing this type of an application is to produce the users more efficient work system instead of doing manual approach. Because of that we should use the most applicable tools available in the market to develop the system. Technological considerations - followed during the development of the system Efficiency and Performance Re-usability and flexibility object oriented development support so according to the Automated Garbage Collection Alert System java and android studio used to develop the mobile application. C# language is used, SQL Server 2012 as database for this project. This chapter includes the details about the technologies that we are going to use to develop Automated Garbage Collection Alert System.

Web Application

The programming language that is going to apply as the developing language for the system development turned into significantly trusted accuracy, performance. When considering all these technologies which can be associated with the Garbage collection system the proposed system can be applied a web based technology. The .NET Framework consists of the common language runtime and the .NET Framework class library. The common language runtime is the foundation of the .NET Framework. You can think of the runtime as an agent that manages code at execution time, providing core services such as memory management, thread management, while also enforcing strict type safety and other forms of code accuracy that promote security and robustness. In fact, the concept of code management is a fundamental principle of the runtime. Code that targets the runtime is known as managed code, while code that does not target the runtime is known as unmanaged code. The class library is a comprehensive, object-oriented collection of reusable types that you can use to develop applications ranging from traditional command-line or graphical user interface (GUI) applications to applications based on the latest innovations provided by ASP.NET, such as Web Forms and XML Web services. For example, ASP.NET hosts the runtime to provide a scalable, server-side environment for managed code. ASP.NET works directly with the runtime to enable ASP.NET applications and XML Web services. C# programs run on the .NET Framework, it runs on a virtual execution system called the common language runtime (CLR) and a combined set of class libraries. The CLR is the implementation by Microsoft of the common language infrastructure (CLI) and it helps to create execution and development environments in which languages and libraries work together without any flaw. C# source code is compiled into an intermediate language (IL) that conforms to the CLI specification. The IL code and resources such as bitmaps and strings are stored on disk in an executable file called an assembly. Assembly is typically creating with an .exe or .dll extension. It contains a manifest that provides information about the assembly such as types, version, culture, and security requirements. When the C# program is executed the assembly is loaded into the CLR. Based on the information in the manifest CLR might take various. When the security requirements are met, the CLR performs just in time (JIT) compilation and convert the IL code to native machine code. CLR also provides other services such as automatic garbage collection, exception handling, and resource management. Following diagram illustrates the compile time and run-time relationships of C# source code files and the .NET Framework. The following illustration shows the relationship of the common language runtime and the class library to our applications and to the overall system. The illustration also shows how managed code operates within a larger architecture.

Figure 1. Interface of the web application

Mobile Application

Android gives you the freedom to put into effect your own device specifications and drivers. The hardware abstraction layer (Hal) presents a well-known approach for developing software hooks among the android platform stack and your hardware. The android working machine is likewise open source, so you can make a contribution your own interfaces and improvements. Android is an open source, Linux-based software stack created for a wide array of

devices and form factors. The following diagram shows the major components of the Android platform.

Figure 2. Interface of the mobile app

Android run time

For gadgets going for walks android version 5. Zero (API level 21) or higher, every app runs in its very own technique and with its own instance of the android run time (artwork). Art is written to run multiple virtual machines on low-reminiscence devices by using executing DEX files, a byte code format designed especially for android that is optimized for minimum reminiscence footprint. Construct tool chains, including jack, assemble java resources into DEX byte code that can run at the android platform. A number of the predominant features of art encompass the subsequent in advance-of-time and just-in-time compilation optimized garbage collection higher debugging guide, such as a dedicated sampling profiler, exact diagnostic exceptions and crash reporting, and the capability to set watch points to screen particular fields previous to android model five.0 (API degree 21), dalvik was the android run time. In case your app runs well on artwork, then it need to work on dalvik as properly, however the opposite may not be real. Android additionally consists of a hard and fast of core run time libraries that offer most of the capability of the java programming language, which includes some java 8 language functions that the java API framework uses.

Database Selection

Consistent with the above eventualities most of the structures are used the square database to keep facts. It seems it is simple to control and perform. So, the database put in force on the server have to able to supplying efficiencies operations. Consequently, the proposed system decided on the Microsoft SQL server 2014 as server. SQL server is the inspiration of Microsoft's data base platform, delivering challenge critical performance with in-reminiscence technology and quicker insights on any information, whether or not on-premises or in the cloud, and also Microsoft SQL Server is an application used to create computer databases for the Microsoft Windows family of server operating systems. Microsoft SQL Server provides an environment used to produce databases that can be accessed from workstations, the Internet, or other media too. Database management or DBMS, store user's data and enables them to transform the

information into statistics. Those systems allow users to create, replace and extract facts from their database. A database is an established collection of information. Facts refer to the characteristics of human beings, things and activities. Square server stores every statistic item in its very own fields. In square server, the fields related to a particular character, thing or occasion are bundled collectively to shape a single complete unit of records, known as a document. Each record is made up of some of fields. No two fields in a record will have the equal area name. Throughout an SQL server database design project, the evaluation of your project wishes identifies all of the fields or attributes of interest. If your commercial enterprise desires trade through the years, you outline any extra fields or alternate the classification of present fields.

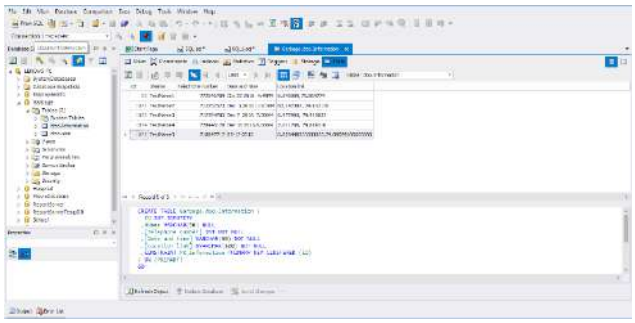

Figure 3. Interface of the Database

IV. EVALUATION

In this, we describe evaluation of our approach and the developed system while evaluating the objectives achieved how the project deviated from its original specifications and the circumstance identified during the time period of the project. This chapter will give the idea of the measure that have been taken to handle the problem occurred and knowledge which have been gathered by supplying solutions for such issues.

A formative evaluation a method for judging the worth of a program while the program activities are forming (in progress). This evaluation is done with the user requirements or the function requirements.

Summative evaluation refers to the assessment of participants where the focus is on the outcome of a program. It is done with a high-fidelity prototype to assess the achievement of product more progressive.

V. CONCLUSION

The results and outcomes generated in relative to the specificity of the problem domain are enlarged into wider concepts depending on logical assumptions. This chapter aims to clearly emphasize the outcomes and findings of the project and to determine way of these outcomes and findings can be matched in different contexts that are similar to the problems which are solved by the developed Garbage collection and alert system. In the rest of the chapter a total summary of the development of the system is given. Furthermore, future enhancements for the developed System have suggested finding out ways to give in addition features to the system and using it outside the business subject in use.

The aim of this project was to develop a Garbage collection alert system as a solution of disposal of garbage in Sri Lanka. The development team implemented this system in order to determine its ability to satisfy the entire functional and non-functional requirement with special qualities such as flexibility, reliability efficiency and etc., to overcome the drawbacks identified in the system. The study found out that it is feasible to use the language ASP.NET in C#, SQL Server 2012 as database and java in android studio used to develop the mobile application to develop the project.

It's is a mobile application and web-enabled project so this mobile application offers user to install the application and enter data. This is very helpful for the user to enter the desired information through so much simplicity. The user is mainly more concerned about the validity of the data, whatever he is entering. In Web server admin provided the option of monitoring the records entered earlier. Data storage and retrieval will become faster and easier to maintain because data is stored in a systematic manner and in a database. Decision making process would be greatly enhanced because of faster processing of information since data collection from information available on computer takes much less time than manual system.

This system allows to get information about the garbage dumps in the relevant city. This gives efficient and cost effective. Mobile application can be access by defined user categories by verifying their username and telephone number and web server can only be access by the admin by verifying the username and password. Client machines can be Windows xp, Windows 7, Windows 9 or Windows 10. Server computer should have operating system Windows xp, Windows 7, Windows 9 or Windows 10 and should be installed Visual Studio 2012, SQL Server 2012 and tool set.

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