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College Fee Management System using IoT

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***Abstract*:- In Universities all over the world, there are a large number of students who pay all their fees through cash deposits, electronic cash transfer or bank drafts to the University's account in specific bank branches. These methods have proven inefficient in more ways than one. It was upon such background that the researchers embarked on a paper aimed at developing an alternate system that enables students to securely pay fees. The system was developed using hypertext preprocessor (PHP), hypertext markup language (HTML) and MySQL database. The new system will assist students in paying their fees and issues them a receipt automatically. The QR – which stands for "quick response" – code is basically a code on steroids, the QR code holds both horizontally and vertically. By integrating both scanner with database linked and particular University Seat Number (USN) related QR-code feels ease to retrieve student's fee payment details along with profile. By automating the process one can have greater control over the process. It includes SQL database, QR- code and in relation to IoT-LED along with Node MCU is considered. Automatic fee management system can replace the manual fee receipt.**

Keywords—IoT, SQL, QR code,USN

I INTRODUCTION

Fee is defined as money regularly paid to a school or similar institution for continuing services. Simply put, departmental fee is that fixed interval payment made by a student(s) to the department for he or she's continued stay in the institution and for the smooth running of the department. From the definition above, one can pinpoint that departmental fee ought to be paid bi-semester. In university systems, there is a need for automated method of storing data [1], so a greater need for an automated online departmental fee management system. This will go a long way in alleviating the various problems and stress involved in the manual method of departmental fee payment. Also the issue of delay in being issued a receipt as a result of inability to complete the tedious manual processing of bank draft will be curtailed[8]. The focus of this research therefore is to provide a reliable and transparent system devoid of personal inclinations and interest, to eliminate the stress of queuing for long hours during departmental fee payment in the study university. Using computer based system for fees payment necessitated this research in order to help solve these problems of either delayed payment[2], or the students not paying at all. Using university systems as the case study, the research has the intention of creating a software that could process students school fees payment to the university's bank accounts and electronically lodging individual students fees indicating name, department, matriculation number, level, date of payment, amount of money paid, academic session/semester, bank details, phone number and some other personal records. This will enhance prompt payment and safe delivery and automatically stop the management and students from being frustrated financially and otherwise. University systems have a large number of students who are supposed to pay all the university fees through cash deposits or bank drafts to the university's account in various bank branches. Prior to now, students often embraced technological advancement with the fear of the unknown and as such have decided to undertake the usual rigorous, stressful and time consuming manual methods [3]. This method of payment has not been efficient enough especially during periods of tests and examinations when most of the students are paying fees to meet the requirements for entering examination halls. The process of fees payment in such periods is characterized by long queues, too much waiting by students and congestion at banks where payments are made. Students queue to pay fees and those who do not reach the counters within the banks' working hours [4] are advised to return the next day. This process has always resulted in students missing to sit for their tests, examinations or even lectures while they are queuing to make their payments. However, the 21st century came with a lot of challenges that only the use of computer can solve effectively. E-payment or automated payment of student's departmental fees in any school would boost the school management and therefore increase[5] productivity thus: 1) Reducing the time staff in the bursary department spend cross checking and balancing cheque books 2) Reduced cash handling or operating a cashless economy makes the students and staff more secure. 3) Management can run the department without fear of financial loopholes. 4) Saves time for the students, making them have more time to invest on their studies [6][7].

Therefore, the payment of students' college fees in a particular college enhances the productivity of such colleges for both the management and students as well.

Even as a computer based system is used for such payment for easiest and fastest mode of operation as well as accurate security and good financial management; which some universities are now operating. Therefore, the paper provides an alternative method that enables secure online fees payment by students.

II OBJECTIVES OF THE STUDY

The objectives of this project is to implement a low cost, reliable and scalable fee management system that can be used to remotely switch on or off any household appliance, using a microcontroller to achieve hardware simplicity, low-cost short messaging service for feedback.

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Fee management applications make it uncomplicated for students and parents to pay the dues and keep a track of fee payment. Here are the top advantages that a student or parent can enjoy while using college fee management software

Check Fee Defaulters: The system should let you check regularly the students who are defaulters in this regard. It should help you send such students – as well as their parents – notifications about pending fees by way of means such as SMS (Short Messaging Service) and email.

Generating Invoice Reports: Generate invoice reports for the fees that are scheduled to be paid immediately. You should also be able to use the system to create custom categories so that you are able to record all the common transactions that are being done in the institution.

- **Track payment**: Parents can make payment online via different payment methods such as debit card, wallet, net banking etc. It provides a safe and simple method for making payment. The app also allows them to track the records of payment whenever they want.

- **Pay from anywhere**: Fee management software allows parents and students to make online payments from anywhere at any time. They do not have to go through the hassles of making manual fee payment.

- **Notifications & Reminders**: The app offers notifications and reminders regarding fee payment in the form of real-time notifications, push notifications, email, SMS etc. Online reminders can offer numerous benefits such as keeping the parents informed about the last date of payment.

- Fee management software allows you to **customize fee structure based** on your unique needs with the ability to set discounts, add or edit fees, and collect penalties with ease.

- The cloud-based fee management system provides fast and automatic backup and online/offline synchronization of data for access to academic data.

Fee automation system is highly secure with easy account management and role-based access control in a multiuser environment.

III REVIEW OF THE RELATED WORK

Table: Description of the various review articles

YEAR	AUTHOR	DESCRIPTION
2018	Shubham Yemul, Rohit Naiknaware, Kalpana Devkar, Varsha Warkhade, Prof. Suhas Kothawale	Shubham Yemul et.al.. Smart star buses for metropolitan cities', The need for a real-time public transport information system is growing steadily. Change money is the main problem in metropolitan star bus system.
2018	Wei Wang, John P. Attanucci, Nigel H.M. Wilson	Wei Wang et. al.. Bus Passenger Origin-Destination Estimation and Related Analyses Using Automated Data Collection Systems', feasibility and ease of applying trip-chaining to infer bus passenger OD from smart card transactions.
2019	Anoop Suresh, Abhijith Unnikrishnan, Gokul P, Nikhil P S, Sarin Abraham	Anoop Suresh et.al.. College bus fee payment system, describes Automatic Fare Collection System implemented by RFID /Smart card, an RFID card is given to the passenger.
2020	R. Santhana Krishnan, Aiswarya Kannan, G. Manikandan, Sri Sathya KB	R. Santhana Krishnan et. al.. Secured College Bus Management System using IoT for Covid-19 Pandemic', The current COVID19 pandemic situation has driven the State Governments and all the college authorities around India to enforce limitations on transportation

IV METHODOLOGY

Download the MySQL, create a new query and with declare & select command create a new table with certain columns. Now create three columns with certain specifications like University Seat Number (USN), Amount update and QR-Code URL. Finally copy the SQL server link from the connection block for further use. In progress, visual studio new project is selected on the basis of .Net framework which provides all the web requests. Then mention the server link to the connection code and provide all the specified conditions to web request. As in, get request- provides all USN Details on display

- Post Request- provides details of students who have paid fee only.
- Put Request- provides details of students on who haven't paid.
- Delete Request- for deleting or editing sections.

Once Code runs from local host copy the dashboard link. Specify the link in postman software and provide the request in order there will be variation taking place in localhost overall view and database keeps updating. In postman, we can actually make changes directly with providing json-format or database Specification. In this procedure, create QR-Code from free websites by providing e-mail and URL of our choice. E.g.-https:/ studentfee.com. Once QR-Code is ready download and specify the URL in database required column. Then later create dropdown box instead of just print and add print as well as QR-Code

A. DATABASE

PHP provides MySQL connect function to open a database connection. A PHP means Hypertext Preprocessor (PHP) and it is a programming language that allows web developers to create a dynamic content that interacts with database. MySQL creates a database for storing and manipulating data, defining the relationship of each table. Clients can make requests by typing specific SQL statements on MySQL. The server application will respond with the requested information and it will appear on the clients' side. That's pretty much it. From the clients' side, they usually emphasize which MySQL GUI to use.C# (pronounced "See Sharp") is a modern, object-oriented, and type-safe programming language. C# enables developers to build many types of secure and robust applications that run in .NET. C# has its roots in the C family of languages and will be immediately familiar to C, C++, Java, and JavaScript programmers. This tour provides an overview of the major components of the language in C# 8 and earlier C# is an object-oriented, component-oriented programming language. C# provides language constructs to directly support these concepts, making C# a natural language in which to create and use software components. Since its origin, C# has added features to support new workloads and emerging software design practices. At its core, C# is an object-oriented language. You define types and their behaviour. The MySQL server, once started, executes even very complex queries with huge result sets in record-setting time. MySQL is a relational database management system based on SQL – Structured Query Language

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B. ANALYSIS OF THE EXISTING SYSTEM

An RFID card is given to the passenger who holds passenger details including his/her destination and calculates the fare and deduct the money. Every time card is swiped only then details can be updated and also approved in terms. The existing method is time consuming. Initially, printed papers or tokens are used as tickets. Nowadays, handheld machines are used to print tickets. This system has many disadvantages. The passengers must carry the ticket till they reach their destination and the conductor should ensure that everyone has got the ticket. Here, the time taken for ticketing is comparatively more and more amount of paper is needed to print the ticket. Normally the access to financial details of the school is limited to only a few members of the staff. They are normal people related to the administration as well as ones who are handling all the groundwork in this regard.

C. ANALYSIS OF THE PROPOSED SYSTEM

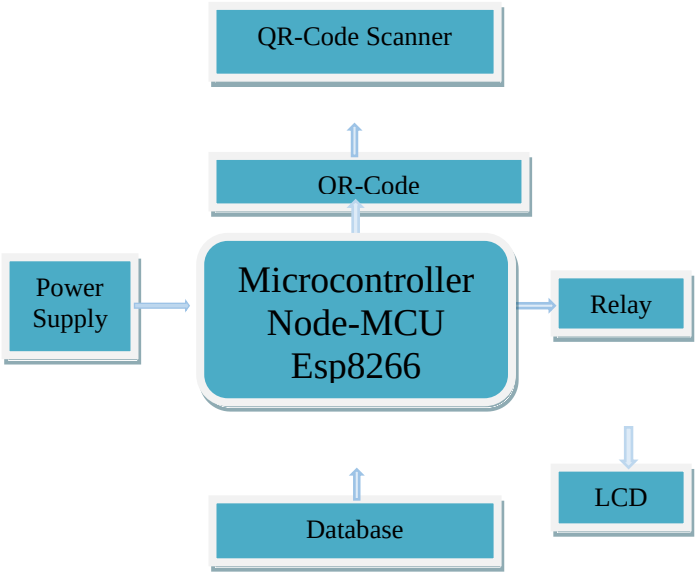
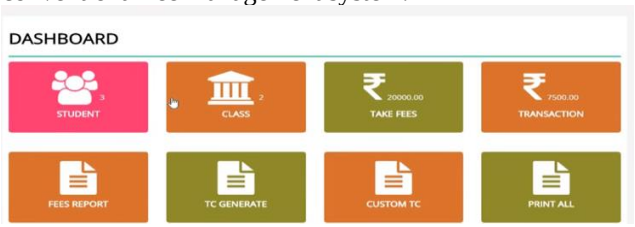


Fig1: Block diagram of the proposed system

The Internet of Things (IoT) generates vast amounts of data, including streaming data, time series data, RFID data, sensory data, SQL database etc. The efficient management of this data demands the use of a database. The very nature of IoT data requires a different type of database. SQL stands for Structured Query Language. It is used for relational databases. A SQL database is a collection of tables that stores a specific set of structured data. In order to connect SQL server to another server, server objects use linked servers and creates new linked server. Then provide remote server name, select remote server type (SQL server or other). Select security, be made using this security context and provide login and password of remote server. This system is made efficient to be used in various other sectors like transport fee management, academic registration pending details. Various branches of the College can manage their fee management using this system. Student fees management system is capable of managing each and every data regarding student, payments etc. Student Management System helps in managing in an extremely efficient way. It includes SQL database, QR- code and in relation to IoT -LED along with Node MCU is considered. Automatic fee management system can replace the manual fee receipt checking. By integrating both scanner with database linked and particular USN related QR-code feels ease to retrieve student's fee payment, Students fee management system is capable of managing each and every data regarding student, payments etc. Student Management System helps us in managing in an extremely efficient way. It includes SQL database, QR- code and in relation to IoT-LED along with Node MCU is considered. Automatic fee management system can replace the manual fee receipt checking. By integrating both scanner with database linked and particular USN related QR-code feels ease to retrieve student's fee payment. This procedure work well in case the length and format of code is fixed. This is time consuming, and data might be mismatched with the student boarding. The main idea behind this project is to collect the fee automatically using the QR-code and scanner in a cost-efficient manner. Implementation of fee management depends on the type of controls like software and network. There are major characteristics of fee management systems:

QR-Code is considered to read overall fee details in one document format. It can be directly scanned into phone. Fee details can be updated up to date and modified if required. Students can edit their personal details. Recent advancements in various technologies have made remarkable developments in various fields for public welfare and public enhancement is one such area. In near future fee management system with advanced technologies like QR-Code along with database will gain spotlight due to their advantage of higher convenience and greater life standards as compared to the conventional fee management system.



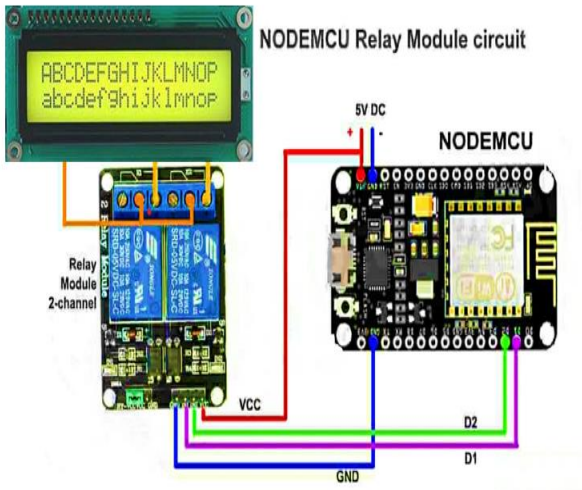


Fig: Functional diagram

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It initially included firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which was based on the ESP-12 module. Later, support for the ESP32 32-bit MCU was added. The NodeMCU has built in LM317 in it, which is voltage regulator. LM317 is an adjustable linear voltage regulator through which 5v supply is directly soldered so that there is no variation in relay. The functional components in this project are Relay module 2-channel. Thus, the NodeMCU Board is programmed using the Arduino IDE software. The function of the relays are the switches which aim at closing and opening the circuits electronically as well as electromechanically. It controls the opening and closing of the circuit contacts of an electronic circuit.NodeMCU is a low-cost open source IoT platform. It initially included firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which was based on the ESP-12 module. Later, support for the ESP32 32-bit MCU was added. The NodeMCU has built in LM317 in it, which is voltage regulator. LM317 is an adjustable linear voltage regulator through which 5v supply is directly soldered so that there is no variation in relay. A 2-Channel Relay interface board allows us to control various appliances, and other equipment's with large current. It can be controlled directly by Micro-controller (Arduino, Node MCU, Raspberry Pi, 8051, AVR, PIC, DSP, ARM, ARM, MSP430, TTL logic). The device connected to the respective relay turned On or OFF as per the users request to the Google Assistant. The microcontroller used is NodeMCU (ESP8266) and the communication between the microcontroller and the application is established via Wi-Fi (Internet). A liquid crystal display (LCD) has liquid crystal material sandwiched between two sheets of glass. Without any voltage applied between transparent electrodes, liquid crystal molecules are aligned in parallel with the glass surface.

D. POWER SUPPLY

Almost all electronics circuits need a power adaptor which converts an unregulated ac into dc in order to operate the electronics device. All devices will have a certain power supply limit and the electronic circuits inside these devices must be able to supply a constant DC voltage within this limit. That is, all the active and passive electronic devices will have a certain DC operating point (Q-point or Quiescent point), and this point must be achieved by the source of DC power. The power supply is designed to convert 230V AC to 12 V DC. This is then converted to 5V and 3.3V for the components' requirements

E. MICROCONTROLLER

Micro-controller is heart of the system. It has number of features and it controls the other components. We can write a program and load the controller to control real time application processes. The microcontroller used is NodeMCU. NodeMCU is an open source IOT platform. It has an in built wi-fi module. The Internet of Things (IoT) has been a trending field in the world of technology. It has changed the way we work. Physical objects and the digital world are connected now more than ever. Keeping this in mind, Espressif Systems has a bite-sized Wi-Fi enabled microcontroller – ESP8266 it can monitor and control things from anywhere in the world – perfect for just about any IoT projects.

F. LCD Display

A liquid crystal display (LCD) has liquid crystal material sandwiched between two sheets of glass. Without any voltage applied between transparent electrodes, liquid crystal molecules are aligned in parallel with the glass surface. A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizers. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in color or monochrome.

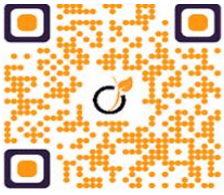
G. PHP

In HTTP request, MIME type is specified in the request header using Accept and Content-Type attribute. The Accept header attribute specifies the format of response data which the client expects and the Content. Type header attribute specifies the format of the data in the request body so that receiver can pass it into appropriate format. Web API converts request data into CLR object and also serialize CLR object into response data based on Accept and Content-Type headers. Several PHP features help create robust terms in certain and durable applications. Garbage collection automatically reclaims memory occupied by unreachable unused objects.

H. IoT

In a nutshell, the Internet of Things is the concept of connecting any device (so long as it has an on/off switch) to the Internet and to other connected devices. The IoT is a giant network of connected things and people – all of which collect and share data about the way they are used and about the environment around them. That includes an extraordinary number of objects of all shapes and sizes – from smart microwaves, which automatically cook your food for the right length of time, to self- driving cars, whose complex sensors detect objects in their path, to wearable fitness devices that measure your heart rate and the number of steps you've taken that day, then use that information to suggest exercise plans tailored to you. Use sensors to detect which areas in a showroom are the most popular, and where customers linger longest. The information picked up by connected devices enables me to make smart decisions about which components to stock up on, based on real-time information, which helps me save time and money.

I. QR-CODE



In this procedure, create QR-Code from free websites by providing e-mail and URL of our choice. E.g.- https:/ studentfee.com. Once QR-Code is ready download and

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specify the URL in database required column. Then later create dropdown box instead of just print and add print as well as QR-Code. Once clicked on QR-Code option page routes by providing QR which can be scanned by Mobile phone and students can safe for further use.

CONCLUSION

The complexities in fare collection have been eliminated and the project is completed successfully using smart card. This project is made with pre-planning, that it provides flexibility in operation. This innovation has made more desirable and economical. The "COLLEGE FEE PAYMENT SYSTEM" is designed with the hope that it is very much economical and helpful for teachers, parents and students during journey.

AUTHOR'S PROFILE

Dr Sudha L K Associate Professor working for the department of Electronics and Instrumentation Engineering, Bangalore Institute of Technology having 26years of teaching experience. Specialization in Nanoelectronics, MEMS, Mechatronics, VLSI and its allied subjects.

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