PRINT ISSN 1119-8362
Electronic ISSN 2659-1502

Full-text Available Online at
https://www.ajol.info/index.php/jasem
http://www.bioline.org.br/ja

J. Appl. Sci. Environ. Manage.
Vol. 27 (6) 1135-1139 June 2023

Use of Mathematical and Unified Modelling Language Tools to Provide Learning Motivation System for Students in Tertiary Institution

***[1]OMEDE, EU; OKPEKI, UK**

*[*1]Computer Science Department, Faculty of Science, Delta State University Abraka, Nigeria*
[2]Electrical/Electronic Department, Faculty of Engineering, Delta State University Abraka, Oleh Campus, Nigeria.

**Corresponding Author Email: edithomede@delsu.edu.ng*
Co-Author Email: ufuomakazeem@gmail.com

ABSTRACT: Prompt information dissemination is essential for effective teaching and learning. This paper presents mathematical and Unified Modelling Language (UML) tools using html and CSS for front end, Python for logic tier and MySQL for the database to provide an SMS-Based Lecture Motivation System which will motivate staff and students for academic activities by alerting them on lecture schedules and reschedules at specific times prior to the scheduled time. The developed prototype was tested on Electrical/Electronic department, it was able to achieve the design objectives.

DOI: https://dx.doi.org/10.4314/jasem.v27i6.11

Cite this paper as: OMEDE, E. U; OKPEKI, U. K. (2023). Use of Mathematical and Unified Modelling Language Tools to Provide Learning Motivation System for Students in Tertiary Institution. *J. Appl. Sci. Environ. Manage.* 27 (6) 1135-1139

Dates: Received: 23 May 2023; Revised: 09 June 2023; Accepted: 10 June 2023
Published: 30 June 2023

Keywords: Motivation System; Lecture Scheduling; Reminder system; Notification system.

Human mind being bugged with many activities has the tendency of forgetting important events and schedules. Many other activities in university can be distractions to teaching and learning by causing forgetfulness to scheduled lectures in the part of both lecturers and students. Sometimes changes are made in the timetable affecting the lecture time and venues, in such cases many students miss lectures because they could not get prompt information on the changes made, while some spend their money to transport to school for lecture only to be told that the lecture has been rescheduled. An alert system is a good tool for prompt dissemination of information to students and lecturers as a reminder for a scheduled class or messages on any adjustment to scheduled classes. Timely information dissemination is essential for effective learning and can be a motivational tool for satisfactory participation of both staff and students in academic activities (Omede and Okpeki 2019). The existing channels of communicating to students on class schedules or adjustment which include phone calls, WhatsApp group chats and physical visit to lecturers' office have not proved to be effective because all the students are not reached through these mediums. Sometimes, the calls are not through, for chatting; some of the students do not have smart phone, some of those who may not have data to keep them online. With existing channels of communication, many students still miss classes especially rescheduled ones because they could not get information on time. Advancement in mobile phones birthed several services like the Short Messaging Service (SMS), Multimedia Messaging Service (MMS) and others, which are readily available and usefulness communication mediums in any institution for fast information dissemination among individuals as soon as they are available. (Pachler, et al., 2010). Use of SMS as communication channel can save resources by avoiding unnecessary visits and phone calls. According to Farrah and Abu-Dawood (2018)

**Corresponding Author Email: edithomede@delsu.edu.ng*

the research on the mobile phone messaging in institutions has received considerable attention for about a decade. The need of curbing the absenteeism of many students from classes arousing from forgetfulness and laxity has stirred a lot on research interest on motivating students to learn by developing alert and reminder systems. An automated lecture alert management system was developed by Adewale et al. (2014) using java programming concept known for its portability. Lukman, et al. (2017) developed a remote lectures programming and audience notification system to provide a fast mechanism of disseminating SMS messages information to the large population. In Ayeni et al. (2017) mobile application on the Android platform for the students of Computer Science, 500level, Federal University of Technology, Akure was developed. Oludare, et al. (2013) successfully designed and developed an enterprise class mass SMS mailing system that support multiple users as well as multiple SMS gateways,. Their system also introduced SMS message scheduling. In Hassan, et al. (2015) a mobile University Notification System for educational institutions was developed using the Jabber Protocol or Extensible Messaging and Presence Protocol (XMPP) for distributed messages between the client-server architecture. Parchment and Sankaranarayanan (2013) developed an intelligent agent-based Student-Staff Scheduling System. Also Jadhav and Gupta (2015) developed Android based academic scheduler. In Jimoh, etal. (2013) SMS application for easy and fast access to information through the use of SMS was developed. The SMS application provides multi-level local authentication to the SMS gateway service and was developed based on the Unified Software Development Process. All these works geared towards encouraging attendance of lectures among students by reminding them of lecture schedules. One major lapse in the reviewed works is their inability to generate a repeated reminder to the students based on the scheduled time for the lectures or any other academic activities. The objective of this paper is to present mathematical and unified modelling language (UML) tools using html and CSS for front end, Python for logic tier and MySQL for the database to provide an SMS-Based Lecture motivation system which will motivate staff and students for academic activities by alerting them on lecture schedules and reschedules at specific times prior to the scheduled time.

MATERIALS AND METHODS

Description of Alert System architecture: The alert system is designed to alert students on their daily activities especially as regards to their lectures by use of Short Message Services (sms). It should be able to let students know all courses they suppose to have each day, their respective times and venues one hour before the starting of the first class for the day and remind them of every class ten (10) minutes before the class. And also intimate them on any change on the pre-scheduled class. The 3-tier architecture module methodology is employed in the proposed system design. This includes, the front-end, middle tier and back end. They were developed using PHP, JavaScript, CSS, Python and MySQL respectively. The students profile used for this alert system is gotten from Delta State university portal by pluggin it to the portal through the Application Programming Interface (API). The system is modelled mathematically and also using Unified Modelling Language (UML) tools in Visual paradigm to show all the componenets and interaction between the components of the proposed system. Figure 1 below shows the Alert System architecture.

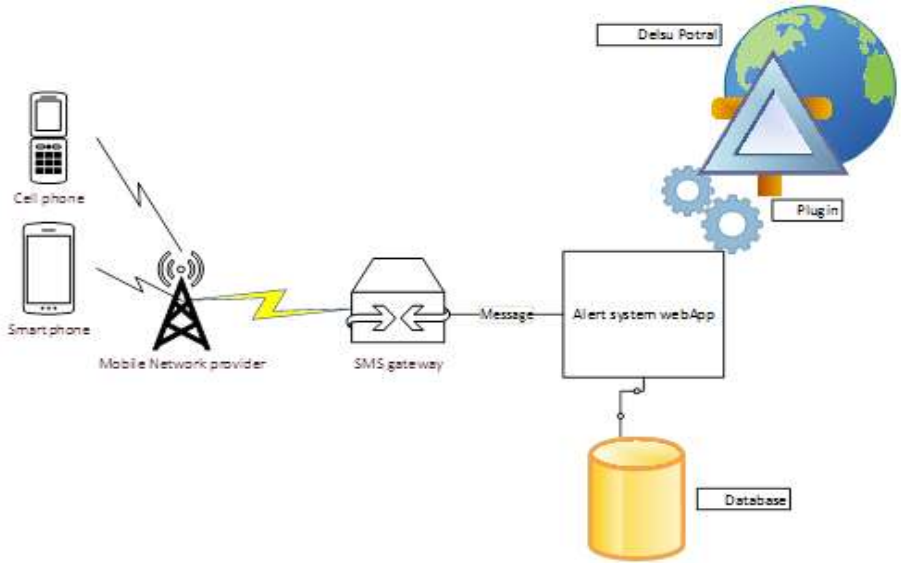

Fig 1: Alert System architecture.

The Figure 1 is the architecture of the proposed alert system showing its relationship with external entities. The Alert system webApp is designed to be a plug in to DELSU Portal through API so that it can fetch student data;(MatNo, Name, Dept, Level, Phone number and registered course and store the in its data frame represented as database. Using these data these data and entry from the Timetable officer, it will generate message and send it with the phone numbers to SMS gateway, which wireless send the message to Mobile network providers from where the SMS is sent to students phones be it cell or smart phones.

Mathematical Modelling of the Proposed Alert system:
Assumptions
A recipient group consist of students who have registered a particular course.
Time table should be planned by officer in charge and be uploaded into the system.
Parameters are D – array of working days of the week (Monday to Friday); T – array of scheduled courses for each day; V – array of venues; C – array of courses

System Constraints: Every student must have an active phone line registered in the University portal
The lecture days should be from Monday to Friday

Indices
$i = 1\ to\ 5\ (days\ index)$
$j = 1\ to\ n\ (Time\ index,$
$where\ n = number\ time\ slots\ per\ day)$
$k = 1\ to\ n\ (venue\ index$
$where\ n\ is\ the\ number\ available\ venues\ for\ courses\ per\ day)$
$l = 1\ to\ n\ (Course\ index,$
$where\ n = number\ of\ scheduled\ courses\ per\ day)$

$$Message = D_I + \sum_{jkl=1}^{n} (T_j + V_k + C_l)$$

Algorithm for SMS sending
Let T_s = first lecture period,
For Ts – 1 (hr) //an hour before the starting time
Query the Time table to generate report of all courses for the day, using day criteria
Group recipients based on registered courses

Select each recipient group phone numbers from students' profile, matching phone number with Matric No. Create message by Selecting Times, Venues and courses for D_i, T_j is time scheduled for course C_l at venue V_k.
Send the message and phone numbers to SMS gateway
If $T_i = T_i - 10$ mins //10 mins before the starting of a class
//Group recipients for course C_l as C_l recipients
Select phone numbers of students where registered course = C_l
//Create message
Select Cl, T for Cl and V for Cl
Send the recipients for the courses C_l and message of C_l to SMS gateway.

Modeling the system using UML tools: The proposed Alert system use case is presented in Figure 2. The use case in Figure 2 shows the requirement of different users from the system.

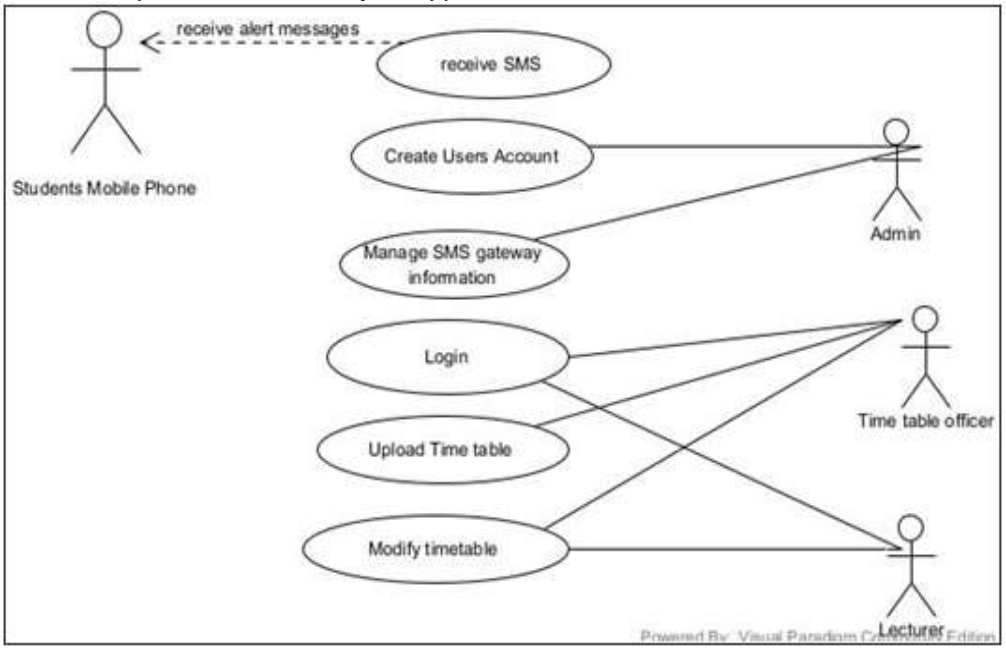

Fig 2: The proposed Alert system Use case diagram

Proposed Alert System Sequence diagram: The Sequence diagram in Figure3: shows the interactions between different objects and sequence of actions in the system to accomplish a user's requirements.

The Proposed Alert system Class diagram: The class diagram in Figure 4 shows the objects, their attributes, operations and relationship between the objects.

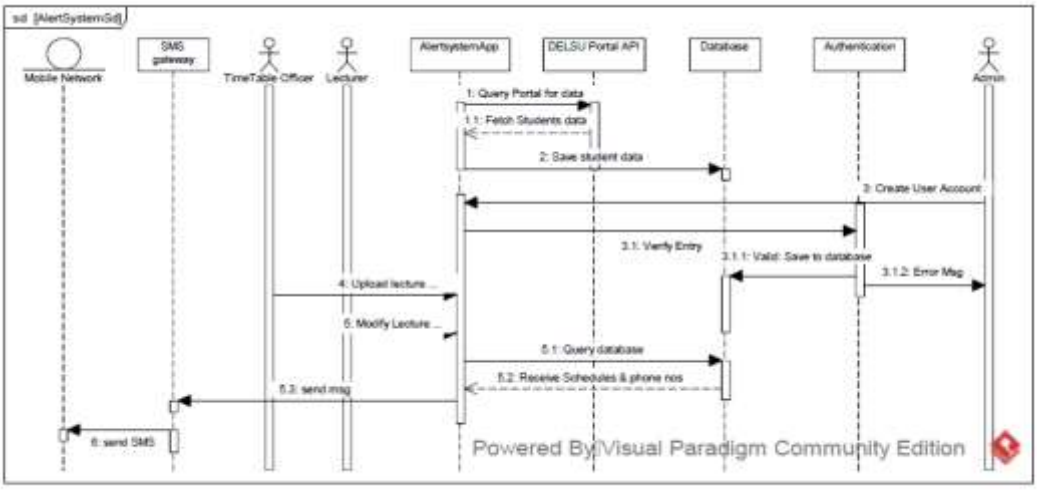

Fig 3: The Proposed Alert system Sequence diagram

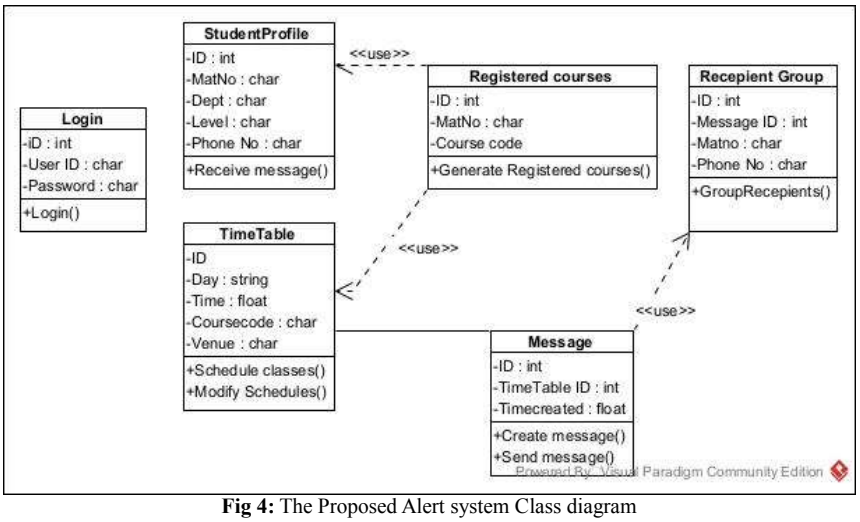

Fig 4: The Proposed Alert system Class diagram

RESULTS AND DISCUSSION

The proposed Alert system is designed using 3-tier architecture. The client side of the architecture is known as the front-end of the system for users' interaction with the system. It is developed using PHP, JavaScripting and CSS. The system through an API should be a plugin to the Delta State University students' portal for fetching of students information: Matric No, Department, Level and registered courses. The middle-tier which is the Application is the logic tier which receives request from front-end, manipulates it by fetching data from database and sends response. This tier can be developed using python. The application tier consists of the components for naming service for supported SMS gateways; message creation service creates message from instances of schedule object based on system time and executor service which sends the message to SMS gateway where it is formatted and send all concerned by calling SMS gateway object send method.

The 3rd Tier referred as Back-End Tier: This is the layer for the system's data and records. This database layer is designed using MySQL.

Interface Design

User Account/Login Page: This is for creation of Users' account and Login to the application. The account creation is for only two categories of users,

Lecturers and Timetable officer. After the first creation of account, the user can login with account details. Based on the account details, the application displays a Homepage menu based on the user's permissible role.

Create Timetable page: This page allows the user (timetable officer) to add new class or edit existing ones. The user readjusts any class not later than one hour before the previously scheduled time.
Manage Schedules page: This page allows the user (Lecturers) to adjust his/her own scheduled class not later than one hour before the scheduled time.

Conclusion: This study has successfully designed Learning Motivation System using UML tools and mathematical functions. The system as a module that would be integrated to the University's portal (DELSU PORTAL) through API can automatically create messages by querying the database using the system's time. The message is sent to the students as SMS through the SMS gateway. The new feature in this proposed system is the ability to generate the message automatically based on system time and also send reminder to students ten minutes before any scheduled class.

REFERENCES

Adewale, AA; Ademola A.; Adebiyi, AA. (2014). Development of an SMS Based Alert System using Object Oriented Design Concept. *IJSTR 3 (4).*

Ayeni, O; Olabisi, D; Olarewaju T. (2017). Lecture Time Table Reminder System on Android Platform (Case Study: Final Year Students, Computer Science Department). *(IJWMT) 7(1):13-33.*

Farrah, MAA; Abu-Dawood, AK (2018). Using Mobile Phone Applications in Teaching and Learning Process. *Int. J. of Research in English Education 3 (2): 49 -68.*

Hassan, MH; Mustapha, EE; Baharuddin HR (2015). Mobile University Notification System: A Jabber-based Notification System for Educational Institutions. *Adv. App. of Elect. Engr., pp. 64-69,*

Jadhav, T; Gupta, R (2015). Android Based Academic Scheduler. *IJRCSSE 3 (5): 1 -6.*

Jimoh, RG; Oluobo, KB; Coco; Abdel, MFO (2013). Design of Mobile Short Message Service (SMS) across A Computer Network for Organisational Communication. *Int. J. of Comp. App. Technology and Research. 2 (4): 409 - 414.*

Lukman, AA; Ahman, EO; Aliyu, SO; Ahmed, AJ; Ajao, F; Mutiu, AA (2017). Remote Lectures Programming and Audience Notification System using Internet of Things Technology. *Inter. J. Engineer 11 -19.*

Oludare, O; Olaniyan, A; Eboda, O; Awolere, A. (2013). SMS-Based Event Notification System. *J. Inf. Engr and Appl. 3 (10).*

Omede, EU; Okpeki, UK. (2019). Design and Implementation of Auto-Tech Resource Sharing System For Secondary Schools In Delta State. *J. of the Nig. Asso. Math. Physics, 51: 325-332*

Pachler, N; Bachmair, B; John C. (2010). Mobile Learning: Structures, Agency, Practices. New York: Springer.

Parchment, D; Sankaranarayanan, S (2013). Intelligent Agent based Student-Staff Scheduling System. *Int. J. of Comp. Inf. Syst. and Ind. Mgt. Apps 5: 383-404*