International Journal of Computer Trends and Technology
ISSN: 2231 – 2803 / https://doi.org/10.14445/22312803/IJCTT-V69I1P105

Volume 69 Issue 1, 23-26, January 2021

Original Article

Automated Students Examination Seat Allocation using Linear Congruential Generator Algorithm

[1]Abubakar Sadiq, [2]Abdullahi Abdulrahman, [3]Olabisi Dada, [4]Anthony Olajide

[1,2,3,4] *Department of Computer Science, Kwara State Polytechnic, Ilorin, Nigeria.*

Received Date: 21 November 2020
Revised Date: 05 January 2021
Accepted Date: 10 January 2021

Abstract *- The use of sequential methods to allocate seats for examination gives room for teamwork among students, increase staff workload, and prone to error. Providing technological solutions to improve examination efficiency becomes necessary. The introduced system uses a Linear Congruential Generator LCG random algorithm to perform the allocation. The LCG algorithm is broadly utilized in simulation and Monte Carlo calculations because they are speedy, occupies less space, and less computational requirements. The system uses a web platform to perform its computation using HTML5, CSS5, javascript, PHP, and MySQLi to design the front and the back ends.*

Keywords *- Seat Allocation, LCG Algorithm, Student Examination*

I. INTRODUCTION

An **e**xamination is an assessment to measure student knowledge, fundamental ability, life skill, aptitude, physical fitness, or experience attain in some other topic. It is a set of questions mostly used to determine students' knowledge on various topics or fields [1]. Providing measures that ensure the smooth running of examinations and discouraging collaboratory malpractice has been a significant concern for most higher learning institutions. Also, the management of course examinations in higher education institutes such as university departments, colleges is an effort-consuming process. Given the continually increasing number of students, this process's complexity is also increasing in terms of both time and effort required for an efficient outcome. During examination periods, it is often the case that large groups of students massively enter exam halls struggling for a seat. However, such an approach usually brings about nervousness and intensity, which disturb the examination procedure's smoothness. An alternative approach is that students individually select seats in lack of a general plan. However, this could also result in an inappropriate examination process and, probably, in unfair examination outcomes, especially in cases where specific ethical conditions/rules are not fully respected(Aravinth et al., 2014). The developed solution addresses allocating students to the examination hall and developing an online application to manage both the examination room assignments and the examination proctor assignments in each room using randomized. The randomized algorithm uses a linear congruential generator (LCG) algorithm to allocate student numbers to examination seats.

The contribution of this paper is:

1. An exploratory study of an LCG algorithm in resolving conflicts associated with examination seating arrangement in higher institution
2. Develop online software that can be accessed globally to automatically generate a randomized examination seating arrangement based on the LCG algorithm.
3. Implement the developed system using PHP scripting language and MySql for the database management

The developed system uses HTML, CSS, and JavaScript programming language, and PHP and MySQL for the database management system.

II. RELATED WORK

[7] uses metaheuristic music inspired harmony search approach to solve the problem of examination seat arrangement. The approach uses hard for the seating arrangement generated and soft constraints for enhancing the seat generations. The harmony search algorithm was optimized to solve the two constraints mentioned earlier. Unfortunately, the computational process is expensive and requires sufficient memory usage. [8] developed a web-based application for allocating students and make examination halls accessible for students online. PHP, HTML, and MySql were used to design the front end and the database. The research did not specify the approach used for seat allocation. [9] present a solution called oPESA, oPESA is an online examination management solution for exam-hall seating arrangement in colleges. The provided solution is a platform developed on HTML, PHP, JavaScript, CSS, SQL, and jQuery. The researchers stated that during examination

periods, it is often the case that large groups of students massively enter exam halls struggling for a seat. As usual, yet not quite efficient approach involves professors and supportive personnel indicating an "on-the-fly" seat assignment. Lastly, the researchers opined that the developed solution was openly available but has only been tested in vitro (case study) and hope that external users also exploit the solution and provide feedback for its functionality and user-friendliness. [10] Using a Genetic Algorithm" develops a solution that deals with implementing a computer program, which employs Genetic Algorithms (GAs) in the quest for an optimal class timetable generator. The developed solution was written in Java and incorporated a repair strategy for faster evolution. The researchers also explain an example using Genetic Algorithms (GAs) to find optimal solutions to the Class Timetable problem. However, the researchers opined that the system does not take care of other constraints like the unavailability of lecturers, the small size of rooms, and the lecturer's time to move from one class to another.

III. METHODOLOGY

The methodology of this paper is the LCG algorithm. A linear congruential generator is among the widely adopted pseudorandom number generator introduced by Lehmer in 1951 [6]. Among the merits of the linear congruential algorithm, which makes it suit for solving research, is its ease of implementation, speed, and little memory consumption.

We defined the LCG algorithm as a recurrence relation:

$$J_{k+1} = (B J_k + C) \bmod Z \qquad \textbf{(1)}$$

Z, b, and C represents the module, multiplier, and the increment

Where **J** is the pseudorandom numbers

Z, $0 < Z$	module
B, $0 < b < Z$	multiplier
C, $0 \leq C < Z$	increment
J_0, $0 \leq J_0 < Z$	start value or seed

Chosen J_0, b, C, and Z appropriate values enhance the performance of the LCG algorithm.

A. Algorithm

Step 1: Choose J_0, B, C, and Z values

Step 2: For numbers in the range (J_1.....J_k)

Step 3: $J_k = (B J_k + C) \bmod Z$

Step 4: Print J_k

Step 5: Repeat 2 and 3

B. Problem Formulation

Let J_1.....J_5 be student number for five students, where the value of the linear array seed is 1, the module value B is 17, the increment value C is 43, and the module value Z is 100. Allocate random seats for students number X_1 to X_5 using the LCG algorithm.

$$J_{k+1} = (B J_k + C) \bmod Z$$

Assumes all students' numbers are integer numbers, and seat number 0 is valid.

The 1st student number $J_1 = (17*1 + 43) \bmod 100 = 40$
The 2nd student number $J_2 = (17*2 + 43) \bmod 100 = 23$
The 3rd student number $J_3 = (17*3 + 43) \bmod 100 = 6$
The 4th student number $J_4 = (17*4 + 43) \bmod 100 = 11$
The 5th student number $J_5 = (17*5 + 43) \bmod 100 = 28$

Students number J_1 .....J_5 allocates seat numbers 40,23,6,11, and 28, respectively

IV. IMPLEMENTATION

The algorithm implementation uses an online platform, where HTML5, CSS5, and Javascript were used to design the front-end. The PHP and MySQLi were used as the scripting language and database design, respectively.
The system is designed in modules, with each module working together to perform examination sitting arrangement using LCG randomize algorithm to enhance the existing system's performance, which are time consumption, high computational need, and memory. The ability to analyze and give focus to the system is explained in the following formats, which are output design, input design, database design, and procedure design

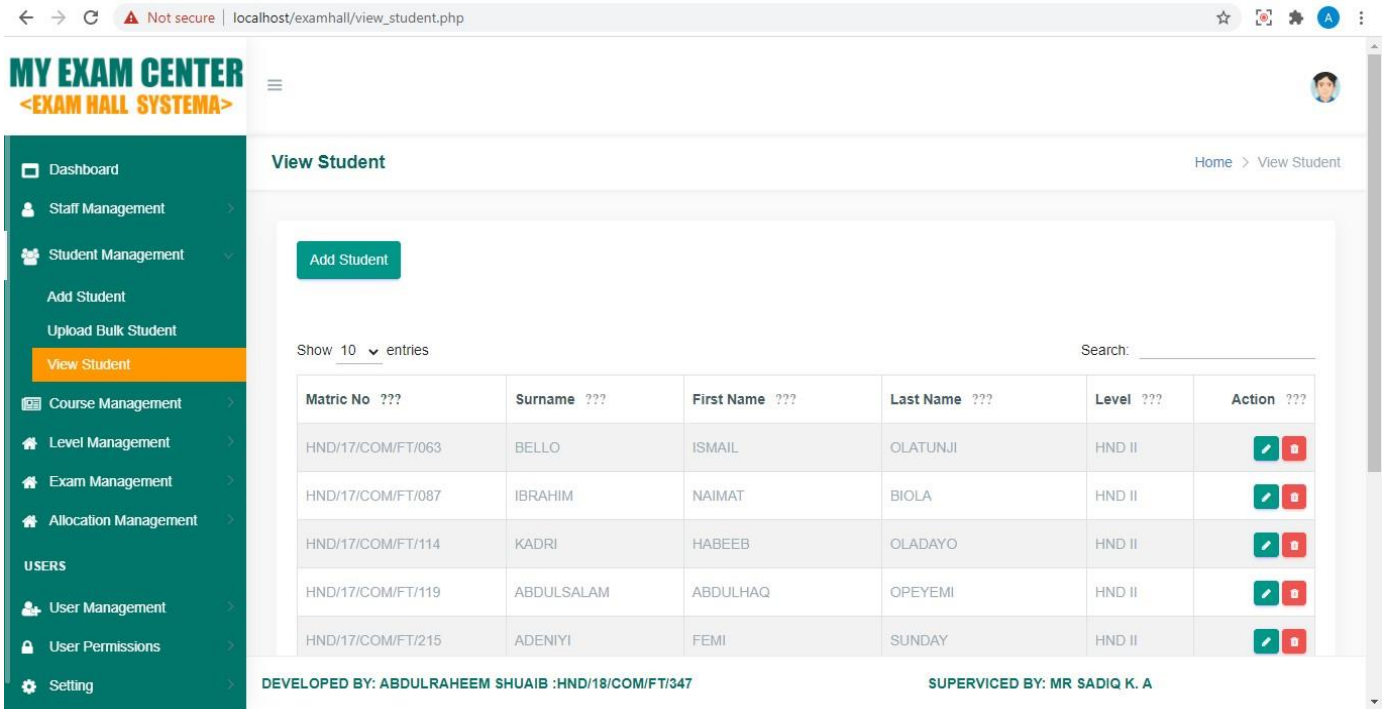

Fig. 1 This page displays all the student list added to the system

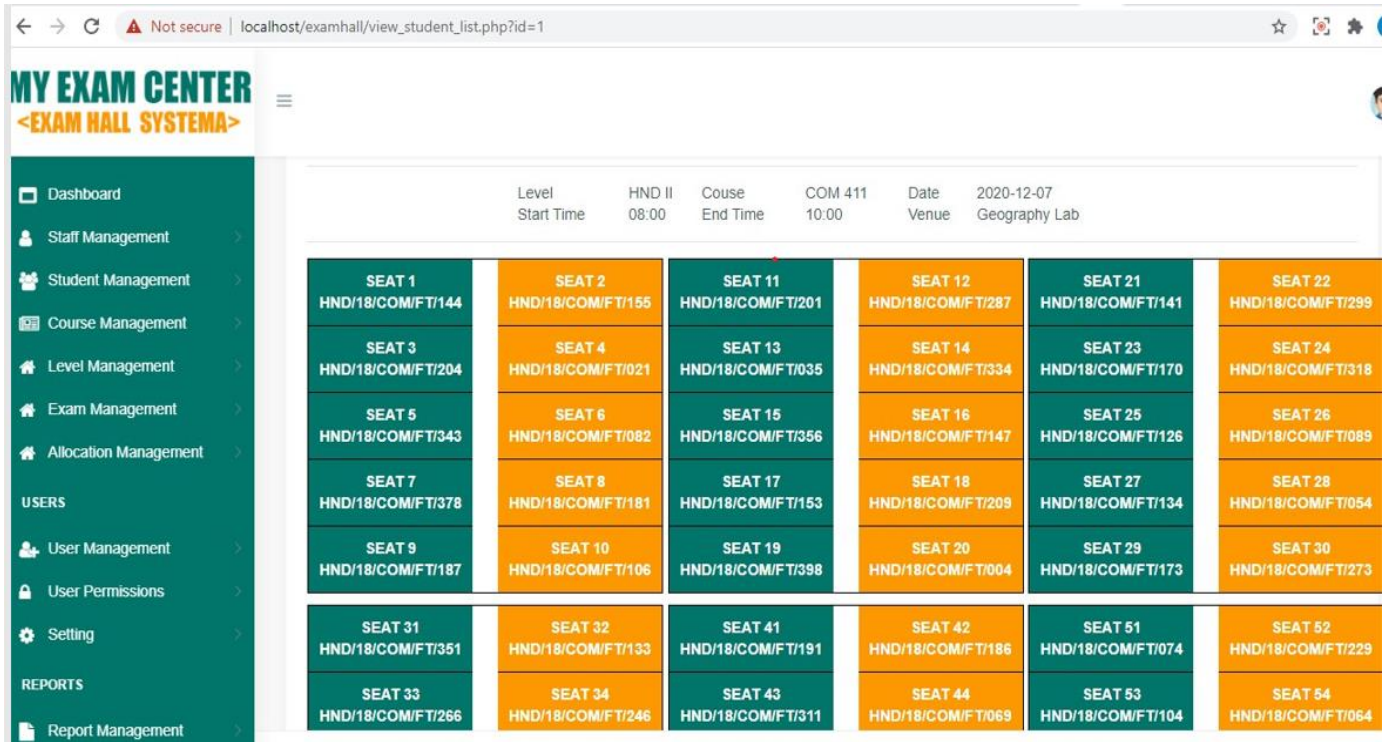

Fig. 2 The seat arrangement of the students with their matriculation number in the system.

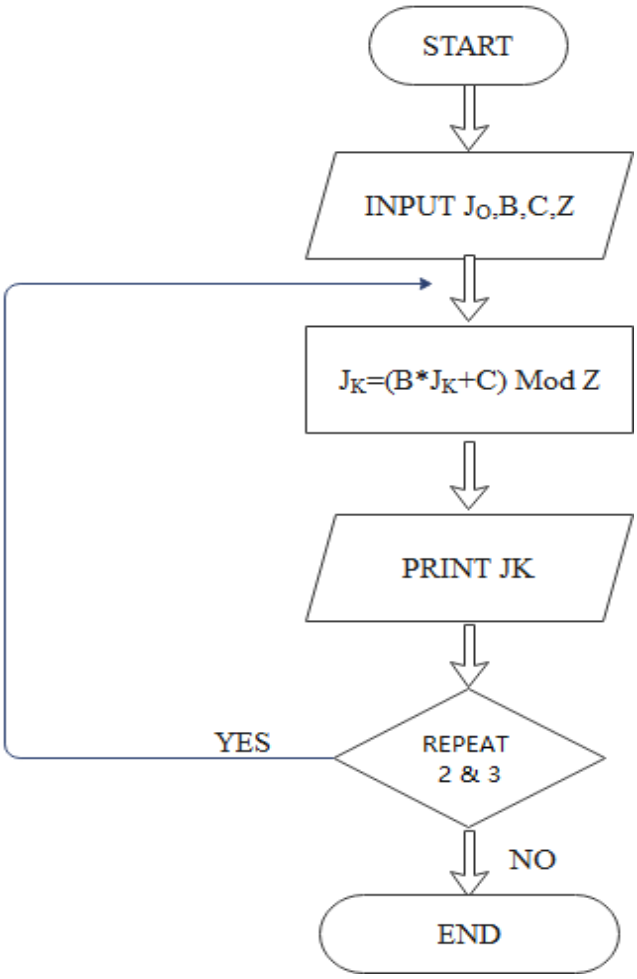

Fig. 3 Flowchart representation of the LCG algorithm

V. CONCLUSION

An automated student seat arrangement allocation was developed using LCG algorithms that randomly assign and organize student seats for examination. The developed system enables each student to see their seat in the corresponding hall quickly. The system uses a web platform to perform its computation using HTML5, CSS5, javascript, PHP, and MySQLi to design the front and the back ends.

REFERENCES

[1] Aashti F. A., Automatic Seating Arrangement Tool For Examinations In Universities/Colleges, International Journal Of Engineering Applied Sciences And Technology, 1 (2016) 8-10

[2] Aravinth1 S. S., Pavithra G., Myvizhimalar M., Divya D., And Rathinakrithika M, Exam Hall Seating Arrangement System Using Php, International Journal Of Innovative Research In Technology, 1(11) (2014) 258-261.

[3] Grobner M. And Peter W. A General View On Timetabling Problems, International Journal Of Computer Science, 1(3) (2014) 1-7

[4] Fernandes C, Caldeira J. P, Melício F, And Rosa A, Infected Genes Evolutionary Algorithm For School Timetabling, Technical University Of Lisbon, Portugal. (2012).

[5] Bharkha N, Ambika G, And Rashmi B., Use Of Active Rules And Genetic Algorithm To Generate The Automatic Time-Table, Proceedings Of 2nd International Conference On Emerging Trends In Engineering And Management, Icetem, 3(3) (2013) 40-45.

[6] Sandeep S. R. And Lakshmi R., A Timetable Prediction For Technical Educational System Using Genetic Algorithm, Journal Of Theoretical And Applied Information Technology, 12 (2005)59-64.

[7] Acharyya A., Losalka A., Gupta P.S., Panda G. Development Of An Automated Examination Seating Arrangement Generation System Using Music-Inspired Harmony Search Algorithm. In: Deep K., Nagar A., Pant M., Bansal J. (Eds) Proceedings Of The International Conference On Soft Computing For Problem Solving (Socpros 2011) December 20-22, 2011. Advances In Intelligent And Soft Computing, (130) (2012) Springer, India. Https://Doi.Org/10.1007/978-81-322-0487-9_29

[8] Aravinth S.S, Pavithra G, Myvizhimalar M, Divya D, Rathinakrithika M, Exam Hall Seating Arrangement System Using Php', International Journal Of Innovative Research In Technology, 1(11)(2014) 258-261

[9] Evi P., Angelos V., Christos K, Online Platform For Automatic Exam-Hall Seat Allocation, International Journal Of Engineering Technologies And Management Research, (5) (2018)52-65

[10] Alberto C., Marco D., And Vittorio M., A Genetic Algorithm To Solve The Timetable Problem, Computational Optimization And Applications Journal, 1(1) (2015) 1-24

[11] Algorithm For An Efficient Seating Plan For Centralized Exam System Prosanta Kumar Chaki; Shikha Anirban 2016 International Conference On Computational Techniques In Information And Communication Technologies (Icctict)

[12] Automatic Exam Seating & Teacher Duty Allocation System Apurva Inamdar; Anand Gangar; Arun Gupta; Varsha Shrivastava 2018 Second International Conference On Inventive Communication And Computational Technologies (Icicct) Ashti Fatima Alam, Seating Arrangement Tools For Examinations," International Journal Of Engineering Applied Science And Technology. 1 (2016)

[13] Prof S.S.Aravinth, G. Pavithra, "Exam Hall Seating Arrangement System Using Php, Ap/Cse Knowledge Institute Of Technology 1 (2014).

[14] Kanetkar, Yashwant P., Let Us C, Bpb Publications, Fourth Edition, (2002)Pp. 251-262, Pp. 138-143, Pp. 147-150,

[15] Efficient Seat Allocation Process In College Exam System Muhammad Ramees C. K 1, Sherin Eliyas2 1mca, 2assistant Professor Hindustan Institute Of Technology And Science, Chennai

[16] M. Ayob And A. Malik, A New Model For An Examination Room Assignment Problem Ijcsns International Journal Of Computer Science And Network Security 11 (10)(2011).